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ABSTRACT

The mission of the Wisconsin Research and Development Center, established at the University of Wisconsin in 1964, was to improve education by conducting basic and applied research and carrying out development ideas, and through dissemination and demonstration. This book presents an historical overview of the center's activities. Chapter 1 traces the history of the center starting with a preparation period, 1954-1964, and provides an overview of both the continuity and changes in the center's activities from one period to the next. Chapter 2 describes the center's major programs to improve elementary schooling, 1964 to 1976, and secondary schooling, 1976 to 1989. In Chapter 3, 11 professors affiliated with the center from 1964 to 1989 give accounts of their knowledge-generating research. Six professors and their teams took major initiative for developing curricular programs and other products. They report their experiences as developers and researchers in Chapter 4. In Chapter 5, 10 former graduate students describe their center experiences and relate the experiences to their present careers. The present and 4 former center directors and 5 academic and clerical staff members give personalized accounts of their work in Chapter 6. The present and 2 former deans of the School of Education describe various facets of the relationship between the center and the school in Chapter 7. Chapter 8 highlights the center's accomplishments and provides some new information. (JD)

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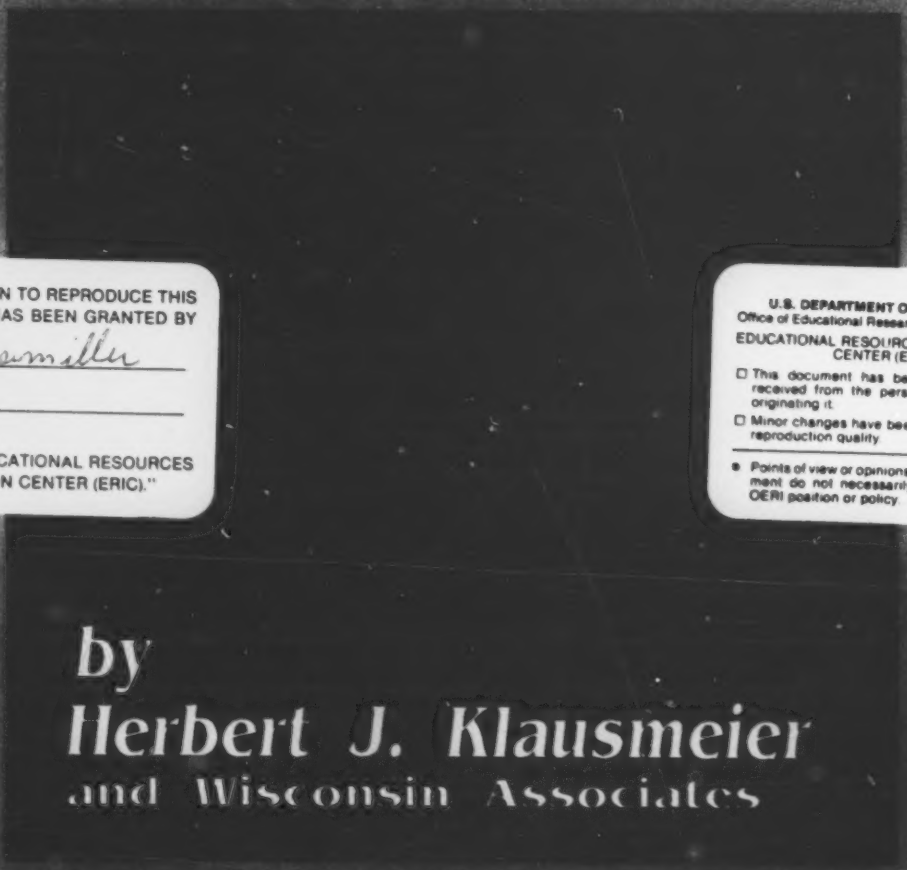
Twenty-Five Years of Knowledge Generation and Educational Improvement



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by
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and Wisconsin Associates

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The Wisconsin Center for Education Research

Twenty-Five Years of Knowledge Generation and Educational Improvement

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The Wisconsin Center for Education Research

Twenty-Five Years of Knowledge Generation and Educational Improvement

by
Herbert J. Klausmeier
and Wisconsin Associates

with a Foreword by Fred Harvey Harrington

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Contents

Foreword ix
Fred Harvey Harrington

Preface xiii
Herbert J. Klausmeier

Credits xvii

1. **Historical Overview** 1
Herbert J. Klausmeier

Preparation, 1954-1964 3
Programmatic Research and Product Development, 1964-1966 6
Programmatic Research, Product Development, and Implementation, 1966-1976 9
Programmatic Research Only, 1976-1985 17
Entering a New Era, 1985-1989 20
Dissemination and Implementation, 1964-1989 29
Bricks and Mortar 30
References 32

2. **Improving Elementary and Secondary Schooling** 35
Herbert J. Klausmeier

Improvement of Elementary Schooling 37
Moving Upward: Toward a Restructuring of Secondary Education 58
Putting It All Together: A Metaplan for School Self-Improvement 66
Re-Emergence of IGE Practices 68
References 73

3. **Knowledge-Generating Educational Research** 77

Herbert J. Klausmeier 78
Julian C. Stanley, Jr. 83
Frank Farley 87
Joel Levin 90
Joseph T. Lawton 93
Penelope L. Peterson 96
Gary G. Wehlage 100
Louise Cherry Wilkinson 103
Cora Bagley Marrett 106
Fred M. Newmann 108
William H. Clune 111

4. **Innovative Product Development and Research** 115

Lee Sherman Dreyfus 116
Richard L. Venezky 120
Thomas A. Romberg 125
Dorothy A. Frayer 131
Marvin J. Fruth 136
Thomas P. Carpenter 140

5. **Experiences of Former Graduate Students** 145

Angela M. Brasil Biaggio 146
Leslie P. Steffe 148
Russell L. Carey 150
Elizabeth Schwenn Ghatala 152
Arie Cohen 153
Lee F. Olsen 154
David Pimm 156
Ann Albuyeh 158
Nancy Lesko 160
Karen Callan Stoiber 162

6. **Reflections of the Center Directors and Support Staff** 165

Herbert J. Klausmeier 166
Richard A. Rossmiller 172
Marshall S. Smith 178
Carl F. Kaestle 181

Andrew C. Porter 184
Danny Guy Woolpert 188
Mary R. Quilling 192
James E. Walter 195
Booker Gardner 197
Lois O'Brien Opalewski 199

7. Insights of the Deans of the School of Education 201

Lindley J. Stiles 203
Donald J. McCarty 208
John R. Palmer 211

8. Epilogue 215
Herbert J. Klausmeier

Knowledge Generation, Synthesis, and Theory Formulation ... 216
Product Development 220
Product Implementation 222
Improvement of Schooling 223
Development of a National R, D, & I Human Resource 225
Strengthening the Federal R&D Centers Program 226
Institutionalization of a Wisconsin Center
for Education Research 228
References 228

Appendixes 231

A Personnel of the Center, 1964-1989 231
B Graduate School Research Committee Grants
to School of Education Faculty 238
C UW-Madison School of Education Extramural
Research Expenditures 239
D Center Books and Instructional/Implementation Materials .. 239

Index 245

Foreword

I was president of the University of Wisconsin in August, 1964, when we signed the agreement with the United States Office of Education establishing what is now called the Wisconsin Center for Education Research (it was then somewhat clumsily labelled the Wisconsin Research and Development Center for Learning and Re-education).

All of us who were present at the inaugural ceremony remember the excitement of the day. Here was recognition of the stature and accomplishments of the faculty and students of our School of Education. Here also was an avenue of opportunity for the future. And it was an adventure of opportunity that was in line with the University of Wisconsin's traditional commitment to innovation and experimentation in teaching, to the union of basic and applied research, to outreach tying the Madison campus to progress in the state and beyond.

Presidents speak on such occasions. When called on, I said that this was "an important day in the history of the university." In other words, it was more than a School of Education event. In many universities, including some of high

prestige, the Education college is virtually a unit by itself and has only formal ties with the rest of the university. At Wisconsin, in sharp contrast, our School of Education has always been an integral part of the whole university. Far from keeping to themselves, Wisconsin's education professors have long been active in campus-wide activities, as in the successful drive of the 1950s and 1960s to get increased support for the social studies and humanities. Joint appointments and shared research have been important in the history of the Wisconsin Center for Education Research.

On the broader front, establishment of the Center was a part of a major movement of our time—the conscious attempt to enlist higher education in research-and-action efforts to help solve pressing problems and improve the quality of life in the United States and abroad.

This movement as we all know is in the Land Grant tradition of using university research and demonstration techniques to tackle the problems of agriculture (we must never forget that we are a Land Grant institution). The sciences were drawn in during the World Wars and in the post-Sputnik era, with academic research being employed to address urgent national needs. The pattern was further extended after mid-century, with university scholars in the social sciences increasingly involved with practical social problems. In the decade that brought us the Wisconsin Center for Education Research the Madison campus saw the coming of the Institute for Research on Poverty, any number of urban and international units, the Institute for Environmental Studies and a good many more. All were set up to promote research and action in the public interest, and to train leaders for the future. All obtained financing from a happy combination of funds from the federal government, the state government and private foundations.

Hopes were high in those days—unrealistically high, I suppose we can say as we look back. Universities simply are not equipped to solve all the problems of the world. Then too, student troubles and budgetary difficulties brought setbacks; and higher education has never quite recaptured the optimism, enthusiasm and momentum of the early and middle 1960s.

Still, some of the spirit of those uplifting days has survived the years of adversity and discouragement. What is more, a surprising number of the research-and-action units proudly launched a quarter-century ago can boast of continuing to do useful work. As the present volume shows, the Wisconsin Center for Education Research is one of the most conspicuous of these. It speaks well for the Center that it has not only kept going but has prospered in difficult times.

Not that everything has gone smoothly for the whole twenty-five years. As is noted in the epilogue, some of the Center's original researchers were not very well prepared to undertake curricular preparation or classroom experiments. A funding collapse made it impossible to realize the full promise of Individually

Guided Education. There were rough spots now and then when the Center changed leadership and emphasis.

The total story, however, is upbeat all the way. The administrators, professors and students who kept the flag flying and did the work make this clear in their contributions to this quarter-century report.

Of the achievements, I find three particularly impressive:

(1) ***Training.*** The twelve-dozen faculty members associated with the Center have trained more than five hundred graduate students. These men and women hold teaching, policy and administrative positions everywhere in the United States and in many foreign countries. Meanwhile our faculty members have broadened and retrained themselves. Thus, the Center has very substantially increased the nation's store of experts capable of (and committed to) improving the nation's schools.

(2) ***Research.*** One cannot help being impressed with the sheer volume, and the quality of research undertaken by and reported on by those connected with the Center. Some of what has been turned out can be described as basic, some as applied; but all has been intended to be useful, and a good deal has proven to be just that.

(3) ***Outreach.*** From the start the Center was designed to reach far beyond the Madison campus. So it has, in spite of limited resources. We are all proud of the Center's impact in the state, its regional and national importance, its cooperation with other centers and the way it has taken up the slack when others have fallen by the wayside.

Yes, those who were present in 1964 are pleased with the record, and by the prospects for the future.

Fred Harvey Harrington

President Emeritus of the University of Wisconsin

Preface

The modern era in educational research and development began in the 1950s. In 1954 Congress passed the Cooperative Research Act. This Act authorized the United States Office of Education (USOE) to enter into cooperative arrangements with universities, colleges, and state education agencies to conduct educational research, surveys, and demonstrations. In 1956 Congress appropriated funds to support the educational research and other activities. USOE funded seventy-two projects in 30 colleges and universities and in six state education agencies in 1956. In 1954 the National Science Foundation was authorized to support course content improvement in the sciences. The first major award was made to the Physical Sciences Study Committee in 1956. Thus, as of 1956, the federal government had started its first support of both educational research and educational product development.

Federal support of educational research and development (R & D) expanded very rapidly after 1956, and in 1963 the USOE initiated a Research and Development Centers Program. Four R & D centers were started in 1964 and six in 1965. The Wisconsin Center was the third one to be established in 1964. These university-based educational R & D centers were new organizations, not only in the United States but in the world. Their mission was to improve education through programs of research, development, and dissemination, including demonstrations in the schools. Human and financial resources were to be concentrated over an extended period of time to solve particular educational problems. Each center was to provide national leadership in its problem area.

In the first chapter of this chronicle, I trace the history of the Wisconsin Center starting with a preparation period, 1954 to 1964. I provide an overview of both the continuity and the changes in the Center's activities from one period to the next: programmatic research and product development, 1964–66; programmatic research, product development, and implementation, 1966–76; programmatic research only, 1976–85; and entering a new era, 1985–89. In chapter 2, I provide the story of the Center's major programs to improve elementary schooling, 1964 to 1976, and secondary schooling, 1976 to 1985. I limited chapters 1 and 2 to factual accounts and made few interpretive comments. I drew from Center and other documents rather than trusting my memory or bringing in personal observations. In writing these chapters, I did not call on present or former Center personnel for information; however, these persons made the Center's history. Therefore, I invited a representative group of them to provide brief accounts of their Center work, biographical information, and a picture to enable the reader to become acquainted with the "concentration of human resources" at the Center across the 25 years and to sample their exceptionally high productivity as researchers and developers. There was no substantive editing of their narratives.

Nearly 150 professors affiliated with the Center from 1964 to 1989. Eleven of them give accounts of their knowledge-generating research in chapter 3. Six professors and their teams took major initiative for developing curricular programs and other products. They report their experiences as developers and researchers in chapter 4. The Center employed over 550 graduate students as research assistants across the years. In chapter 5 ten of them describe their Center experiences and relate the experiences to their present careers. The present and four former Center directors and five academic and clerical staff members give personalized accounts of their work in chapter 6. The present and two former deans of the School of Education describe various facets of the relationship between the Center and the School of Education in chapter 7. I provide a brief introduction to each of the contributors' chapters, 3 through 7. In chapter 8, I highlight the Center's accomplishments, drawing from the earlier chapters and providing some new information. Here, I go beyond the data given.

This is a unique historical account of an organization in several ways. First and foremost is the fact that the makers of the history record it. I find no other historical account that takes this personal approach, yet chapters 3 through 7 are by far the most interesting historical accounts that one can find anywhere. Another unique feature is that this is the first history of any of the 10 R & D centers and 20 regional educational laboratories that were established with federal funding between 1964 and 1967. Only seven of the original 10 centers and seven of the original 20 laboratories that started in the 1960s were continuing in 1975. Moreover, as of 1985, the Wisconsin Center and all other centers ceased functioning as they had until 1985. None received federal funding except as they may have been successful in competing for one of the non-continuing five-year,

research-only centers that the U.S. Department of Education funded in 1985. The Wisconsin Center was successful in this competition. A final feature that makes this history unique is the fact that the Wisconsin Center not only survived; to the contrary, while other centers and regional educational laboratories were being "defunded" (USOE term), the Wisconsin Center made remarkable progress, not only in one program area—research, development, implementation, or personnel development—but in all four. No other center or regional educational laboratory established this kind of productivity in all four areas.

A note may be in order regarding one outcome of the Center's early productivity—federal funding of the educational research facility shown on the cover and on page 34 of this book. Assisted by Dan Woolpert (see chapter 6), I wrote a proposal that resulted in the procurement of $4 million (in 1970 dollars) of federal funds for the facility, called Educational Sciences 1. Another $4 million became available from state funds as a response to building priorities established years earlier under former Dean Lindley Stiles (see chapter 7). From 1967 to 1972 when the Center moved into the building, Woolpert, myself, Professors Marvin Fruth, Robert Petzold, and many others worked to see that ideas about educational R & D, school improvement, and brilliant university teaching took form in bricks and mortar. Former Dean Donald McCarty (see chapter 7) supported the project to the fullest.

This history is intended for persons who are interested in educational research or the improvement of schooling through educational research. Professors and students in seminars and other graduate courses will find it interesting and instructive, a helpful resource. They can identify with their counterparts in the 26 different departments of the six schools and colleges of UW-Madison who carried on the Wisconsin Center's work across the 25 years. The Schools and Colleges include Education, Letters and Science, Family Resources and Consumer Sciences, Law, Engineering, and Agricultural and Life Sciences. Educational leaders in local school districts and in state and federal education agencies will see how practitioners and educational researchers working together carry on educational R & D effectively and get the outcomes of their efforts into the schools. Too, they will see that at any given time social and political conditions over which they have no control may negate the beneficial effects of educational R & D on schooling practices. Educational practitioners and others who endorse schooling that focuses on the individual child's educational development will find many helpful concepts and practices.

I want to thank the many persons who contributed to this chronicle and especially those no longer employed by the University of Wisconsin: Lee Sherman Dreyfus, former Governor of Wisconsin and a current member of the University's Board of Regents; Dorothy Frayer, Vice President of Academic Affairs, Duquesne University; Booker Gardner, Principal, Van Hise Elementary School, Madison (WI) Metropolitan School District; UW President Emeritus Fred H. Harrington; Professor Penelope Peterson, Michigan State University; Mary R. Quilling, Pro-

gram Director, Education and Human Services Directorate, Advanced Technology, Inc., Indianapolis, IN; Marshall Smith, Dean of the School of Education, Stanford University; Professor Emeritus Julian Stanley, The Johns Hopkins University; former Dean of the School of Education Lindley Stiles; Professor Richard Venezky, University of Delaware; Professor James Walter, University of Missouri-St. Louis; and Louise Cherry Wilkinson, Dean of the Graduate School, Rutgers University. I am deeply indebted to the former graduate students who contributed to chapter 5: Angela M. Biaggio, Federal University of Rio Grande do Sul, Porto Algre, Brazil; Leslie P. Steffe, Research Professor, Department of Mathematics Education, University of Georgia; Russell L. Carey, Educational Consultant, Iowa Department of Education; Elizabeth Schwenn Ghatala, Professor of Educational Psychology, University of Houston; Arie Cohen, Professor of Education, Bar-Ilan University, Ramat Gan, Israel; Lee F. Olsen, Superintendent of Schools, Bellingham, WA; David Pimm, Faculty of Mathematics, The Open University, Milton Keynes, England; Ann Albuyeh, Associate Professor and Graduate Program Director, Department of English, University of Puerto Rico; Nancy Lesko, Assistant Professor of Education, Indiana University; Karen Callan Stoiber, Assistant Professor of Psychology, Northern Illinois University.

John Palmer, dean of the UW School of Education, provided salary support and current Center Director Andy Porter arranged for word processing and supplies. They also took care of publication matters and complimentary copies to the contributors and others. Jerry Grossman, Director of the Center's Business Office, provided the budget information presented in chapter 1 and checked its accuracy. Sandy Treptow of the Business Office supplied the information regarding the Center staffing across the 25 years and helped me locate documents in the Center's Archives. Ward Mason, former R & D Centers Program Director of USOE, provided a history of the R & D centers from 1963 to 1983 and USOE in-house mimeographed materials that indicated key federal legislation and USOE policies and practices. Carl Kaestle, an eminent educational historian, read the first draft of chapter 1 and showed me how to change my writing from that of an educational psychologist reporting a research project to that of a historian. I am not sure how well I learned. Debbie Stewart, the Center's Senior Editor, was helpful in getting all kinds of information. She responded to my innumerable requests for a specific document, name, or date, edited the successive drafts of my chapters, and assisted me in copy-editing the chapters of the contributors.

I am indeed grateful for the assistance from all these persons; without it I might well have spent years of my retirement in writing through proofing instead of months.

Herbert J. Klausmeier

July 15, 1990

Credits for Quotations

Page 6: From an address given by Robben Fleming, Chancellor, UW-Madison, July 1, 1965. Cited in H. J. Klausmeier & G. T. O'Hearn (Eds.), *Research and development toward the improvement of education*, p. 155. Madison, WI: Dembar Educational Research Services, 1968.

Page 20: From a written statement of Chancellor Donna Shalala in recognition of the Center's 25th anniversary.

Pages 38 and 39: From "Introduction: IGE and educational reforms," by Francis S. Chase, p. xi. In H. J. Klausmeier, R. A. Rossmiller, & M. Saily (Eds.), *Individually Guided Education: Concepts and practices*. New York: Academic Press, 1977.

Page 42: Statement of Norman Graper, principal of Wilson Elementary School in Janesville, WI, one of the first seven schools that changed to IGE in 1967-68 and, like all other elementary and middle schools of Janesville, was IGE in 1989-90. In H. J. Klausmeier, *Individually Guided Education in the multiunit elementary school*. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1971.

Page 50: From an address given by William Kahl, Wisconsin Superintendent of Public Instruction, to a conference of district administrators and principals in Wisconsin Dells in 1969. In H. J. Klausmeier, R. A. Rossmiller, & M. Saily (Eds.), *Individually Guided Education: Concepts and practices*, pp. 303-304. New York: Academic Press, 1977.

Pages 51 and 52: From W. C. Meierhenry, "Development of multimedia teacher education materials. A case study," pp. 235, 237. *Journal of Teacher Education*, 1976, 27.

Page 52: From the bylaws of the Association for Individually Guided Education, 1973, p. 1. Cited in H. J. Klausmeier, R. A. Rossmiller, & M. Saily (Eds.), *Individually Guided Education: Concepts and practices*. New York: Academic Press, 1977, p. 307.

Page 54: From an address by B. Othaniel Smith to the American Association of Colleges for Teacher Education Leadership Training Institute, Charleston, SC, June 12, 1977. Cited in *Five-year plan of the Wisconsin Research and Development Center for Cognitive Learning*, p. 1. Madison: Wisconsin R & D Center, 1977.

Page 202: From "Education school receives top ranking," p. 5. *Wisconsin Week*, March 28, 1990.

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Shown at the signing of the contract establishing the Wisconsin Research and Development Center for Learning and Re-education are, front row, left to right: Herbert J. Klausmeier, co-director for research; Howard F. Hjelm, director of basic research, USOE; and UW President Fred Harvey Harrington. In the back row are, left, Dean Lindley J. Stiles of the School of Education and James J. Conway, fiscal management officer of the Basic Research Bureau of USOE.

1 Historical Overview

Officials of the University of Wisconsin and the United States Office of Education (USOE) signed an agreement on August 6, 1964, to establish the Wisconsin Research and Development Center for Learning and Re-education. The principals to the signing expressed their high expectations for the Center in a number of ways (Klausmeier, 1965, pp. 1–2). University President Fred Harvey Harrington remarked that the signing denoted "an important day in the history of the University. This agreement marks the culmination of years of effort devoted to the improvement of the research capabilities of the School of Education and opens the way to still greater developments." Howard F. Hjelm, then USOE Director of Basic Research, noted that the agreement followed the new pattern in educational research of full institutional commitment: "The University has pledged itself to fully investigate the problem of learning and to disseminate research findings in a way which will bring about definite changes in school practices." Hjelm found the University of Wisconsin well suited for the commitment it had accepted. "The University was chosen because of the exceptional quality of its educational researchers, because of its excellent relationship with local schools

and with the State Department of Public Instruction, and because of the wholehearted dedication to the project existing in Madison."

Lindley J. Stiles, Dean of the School of Education and the Center's Co-Director for Administration stated, "The establishment of this Center is the culmination of many years of cooperative effort to secure the kind of support needed to improve learning in the schools through research. The School of Education at the University of Wisconsin will lead the national effort toward this goal. The full resources of the School of Education will back the Center." As the Center's Co-Director for Research, I stated the primary focus of the Center: "Research emphases will be on learning by children and youth in normal school situations. Especially stressed will be the learning of concepts and problem-solving techniques in mathematics and other basic subjects."

The Wisconsin R & D Center started operating in September of 1964 under provisions of the Cooperative Research Program of USOE. In 1964 the Cooperative Research Program included six major areas: (1) basic and applied research, (2) demonstration, (3) curriculum improvement, (4) small contract, (5) research and development centers, and (6) developmental activities. USOE Publication 12017, 1963, indicated that "research and development centers are designed to concentrate human and financial resources on a particular problem area in education over an extended period of time in an attempt to make a significant contribution toward an understanding of, and an improvement of educational practice in, the problem area" (Klausmeier, 1965, p. 2). More specifically, the personnel of a center will:

1. Conduct basic and applied research studies, both of the laboratory and field type.
2. Conduct development activities designed to translate systematically research findings into educational materials or procedures and field test the developed products.
3. Demonstrate and disseminate information about the new programs or procedures which emerge from the research and development efforts. These activities may include demonstrations in a natural, or operational, setting; the preparation of films, tapes, displays, publications, and lectures; and the participation in symposia and conferences.
4. Provide nationwide leadership in the chosen problem area.

Professors at the University of Wisconsin (UW) had conducted educational research as individuals prior to 1964, but the idea of long-term collaborative effort was a new one. By 1989, many of them were nationally prominent for such collaborative team effort, testimony to the influence of the Center across the 25 years. We now examine the 25-year history, organized into five time periods.

PREPARATION, 1954-1964

The Center's mission was to improve education by conducting basic and applied research and carrying out development activities and dissemination and demonstration. During the decade before the Center started, the professors who first affiliated with the Center had gained some experience as individuals in one or more of the preceding areas with support from UW or USOE. We turn to UW support first.

In 1953–54 the total educational research support to the School of Education was $33,000; $25,000 came from the UW Graduate School Research Committee and $8,000 from gifts and trusts.[1] Funding from the Graduate School Research Committee increased across the years, especially after the Cooperative Research Act of 1954 was funded in 1956. Foundations also came in with support. In 1959 Professor John Guy Fowlkes (1962), who had recently retired as Dean of the School of Education, received a very large grant of $625,000 from the Ford Foundation to support a program of school improvement. Many UW professors had research support from this program.

The Wisconsin Improvement Program, 1959–61, directed by John Guy Fowlkes (left) and supported by UW President Conrad Elvehjem (right), created a favorable climate for educational research in the University, the Wisconsin Department of Public Instruction, and the elementary and secondary schools of Wisconsin.

My first research support came in 1955 from the UW Graduate School Research Committee. Other professors who joined the School of Education after 1952 were supported by this Committee. The typical grant was a stipend for a graduate student research assistant and a few supplies. Salary support to the professor for a summer or a semester was fairly common. Other support came from school districts through a cooperative educational research agreement between the School of Education and a district. This too was small, but it supplied funds for a research assistant or two.

Although the early support was meager, it provided rich experiences. We learned to write proposals, to compete for scarce monies, and to design, conduct, and report research. We also learned to work with school practitioners in getting their input in conceptualizing research problems and in carrying out the experimental instructional treatments. Needless to say, this kind of experience proved beneficial when we moved to the federal research arena.

We now turn to the history of federally funded research as outlined by the National Center for Educational Research and Development (1969, pp. 39–68). Later, we will return to the experiences of the professors who first affiliated with the Center. I shall not present the early struggle for federal funding of educational research. Former School of Education Dean Lindley Stiles, the foremost national quarterback in getting Congressional support for educational research, tells us about this in chapter 7.

The U.S. Bureau of Research, the antecedent of USOE, was established in 1867. From then through 1954 the Bureau's main activity was collecting and disseminating statistical information about education in the United States. In 1954 the 83rd Congress passed the Cooperative Research Act, authorizing the Commissioner of Education to enter into financial agreements with colleges, universities, and state educational agencies for research, surveys, and demonstrations in the field of education. The same year the National Science Foundation authorized support for curriculum development in science. The combination of these two events marked a major turning point for educational research and development in the United States, at the University of Wisconsin as well as elsewhere. The 1954 Cooperative Research Act did not provide any funds for educational research; however, Congress appropriated $1,020,190 in June of 1956. From 1958 through 1963 Congress funded many new programs: research and demonstrations on the uses of new media for education and for foreign language studies; curriculum improvement in English, language arts, and the social sciences; research and demonstrations in the area of the education of handicapped children and youth; and research in vocational education. The 1963 Cooperative Research Act provided funds for establishing the first research and development centers. Four centers, including the Wisconsin Center, started in 1964 and six started in 1965.

Six of the first eight professors who affiliated with the Wisconsin Center in 1964 had received research support from USOE prior to the opening of the Center: Frank Baker, Chester Harris, Thomas Johnson, Herbert Klausmeier, Bur-

ton Kreitlow, and Julian Stanley.[2] Most of their projects dealt with learning, measurement, or evaluation. However, Kreitlow had one project on adult re-education and another one on the reorganization of Wisconsin school districts. Both of these interests, as well as those related to concept learning and teaching, were included as Center projects when the Center started operating in 1964. The other two professors who first affiliated with the Center were Henry Van Engen, Professor of Mathematics and Education, and Lee S. Dreyfus, Professor of Radio, TV, and Speech. Professor Van Engen was directing the production of the first edition of an instructional TV program in elementary mathematics, *Patterns in Arithmetic.* WHA-TV, the UW station established and directed by Professor Dreyfus, was broadcasting it in Wisconsin (Klausmeier & Stiles, 1964, pp. 20–22). The school improvement program of Professor John Guy Fowlkes supported the development of *Patterns in Arithmetic.*

I have given considerable attention to events leading to the establishment of the Center. The remainder of this chapter provides an overview of the Center's programs across four time periods. The account of each period starts with the Center's name and the directors' names. Then I provide the funding period and the amount of funding for each of four kinds of activities: programmatic research, development of a curricular program or some other educational product, dissemination of information, or implementation—getting a product into the schools. A brief description follows regarding the Center's focus, its programs, and the projects of the programs. The titles of the programs and the projects indicate the substantive focus of the Center's work. As we move from one time period to the next, I point out continuities and changes in the Center's focus and programs.

This chapter touches very briefly on the outcomes of the Center's research, product development, and implementation activities. Other chapters provide this information. In chapter 2, I describe the Center's major educational products, explain how they were gotten into use in the schools, and indicate their effects on student performances. Eleven of the 141 professors[3] who focused on knowledge-generating research report on their work in chapter 3. Six professors who engaged in educational product development and related research summarize the outcomes of their activities in chapter 4. Ten former graduate students, who worked as project or research assistants and who are representative of the total of over 550, describe their Center experiences in chapter 5. In chapter 6, each Center director gives a personal account of his period in the office. Also in that chapter, academic personnel describe their roles in the Center's operation, and the secretary to the present Center director writes from the perspective of classified staff. Deans of the School of Education describe relationships between the Center and the school and the university in chapter 7. Taking the information in these chapters into account and drawing from the vast collection of material in the archives of the Wisconsin Center, I summarize the Center's remarkable accomplishments in chapter 8.

PROGRAMMATIC RESEARCH AND PRODUCT DEVELOPMENT, 1964-1966

With so much emphasis on education in today's world, it would be easy to drift along the well-marked paths of the past. The strength of our School of Education lies in its restless innovation. In cooperation with the schools of the state, it is forever trying new ways to improve the primary and secondary schools. In residence its curriculum is marked by an unusual degree of cross-fertilization and by an interdisciplinary faculty. Its research is probing the frontiers of the learning process, asking, in effect, whether we are on the right path to begin with.

UW Chancellor Robben Fleming, 1965

Center name and directors

Wisconsin R & D Center for Learning and Re-education, 1964-66

Herbert Klausmeier, Co-director for Research	9/64 – 8/67
Lindley Stiles, Co-Director for Administration	9/64 – 5/65
Max Goodson, Co-Director for Administration	6/65 – 8/67

Funding information for 1964-66

Period	Amount	Source	Purpose
9/1/64–8/31/65	$ 499,600	USOE	Programmatic Research and Product Development
9/1/64–6/30/65	12,000	State	Programmatic Research and Product Development
9/1/65–8/31/66	808,081	USOE	Programmatic Research and Product Development
7/1/65–6/30/66	80,000	State	Programmatic Research and Product Development

Center funding increased sharply from the first to the second year. The School of Education greatly increased its support, using monies from its ongoing research budget provided by the state of Wisconsin. (The fiscal year of the University ends on 6/30.) USOE support increased by about 60 percent. (Its fiscal year ended on 8/31.) These increases permitted the Center to expand its scope of work markedly from the first to the second year. With respect to the federal monetary support, USOE tacitly assured centers five years of support at the time it initially funded a center; however, each center had to prepare an annual program plan and budget request to secure any funding. The amount of funds

provided by USOE from year to year took into account the productivity of the center during the preceding year(s), the quality of its proposed program and related budget needs, and the capability of its staff to carry out the proposed program. Across the years from 1964 onward, some centers had increases in funding, others a constant level of funding, and still others decreases and eventual cessation of funding.

We now turn to the Wisconsin Center's start-up years and will see how the Center mission was reflected in its programs. The Center mission for 1964–66 was quite broad in terms of including both school and nonschool settings and a wide age range of learners "to improve the efficiency of learning, both formal and informal, by children, youth and adults" (Klausmeier & Stiles, 1965, p. iii). This same breadth is reflected in the emphasis given to cognitive learning and to vocational skills: "How learning takes place—particularly the development of concepts and problem-solving or thinking abilities essential to the mastery of school subjects and vocational skills—will be investigated through sustained, systematic basic and applied research." The school and adult re-education themes are most apparent in the substantive areas to be studied: "Outcomes of learning in the cognitive domain, especially concepts and problem solving, will be given attention as one aspect of the general objective. Outcomes in the affective domain also will be treated since they are critical in re-education programs."

In accord with this mission, the Center in its first two years carried out activities incorporated in three programs: basic research on concept learning, concept learning in subject areas, and coordinated projects (Klausmeier, 1965, pp. 14–31). The basic research included two projects—laboratory experiments to identify the strategies that students use in learning concepts and computer simulations to identify the specific mental processes that students employ in learning concepts. The second program focused on concept learning in the subject fields of mathematics, science, speech, and political science. Here the objectives were to identify the basic concepts of the subject field, find out more about how students learn and might be taught the concepts, and then develop prototype instructional programs. One aspect of the mathematics project was the development of an instructional TV program, *Patterns in Arithmetic*. This was the first educational product developed by Center staff. The research conducted in the first two programs was truly programmatic in that every project focused on some aspect of concept learning or teaching. The third program included projects on adult re-education, the culturally disadvantaged, instructional television, social variables in learning, and research methods. The coordinated projects reflected interests of professors that were not directly related to the Center's primary focus on concept learning or concept teaching.

The research projects were staffed by one or two professors and two to five graduate student research assistants. *Patterns in Arithmetic* had a much larger staff that, at different times, included one or more full-time project associates in addition to the professor and the graduate students. Although the professors

worked on their projects during the academic year and summer session, typically they were on the Center payroll for only a small part of the academic year but full time for the two-month summer session. This arrangement proved to be economical of the Center's funds and highly desirable both financially and in terms of research productivity for the professor and graduate students. Even more important, the professors were able to continue a full teaching load during the academic year. They brought their research experiences into their undergraduate and graduate classes immediately. The professors and their research assistants planned and discussed the Center research projects in graduate seminars in which the research assistants and other graduate students were enrolled. This contributed to the advancement of the School of Education as a leader in educational research.

All of the first-year projects continued into 1965–66. In 1965–66 the Center started new projects in reading, pre-reading, creative problem solving, and restructuring elementary schooling. Many of the new and second-year projects continued for three years or longer.[4] At the end of the second year, Center funding of the projects on adult re-education, the culturally disadvantaged, and instructional television ceased in accordance with plans worked out cooperatively by the project directors and the Center administration. The mission relative to re-education was discontinued, and the Center became the Wisconsin R & D Center for Cognitive Learning.

The projects did not continue for a number of reasons. The project directors, as well as the Center administration, recognized that we could not carry on programmatic research in both the cognitive and affective domains at all school levels, much less at the postsecondary level also. Even more important, we would be unable to get our research outcomes into the schools. Our current and anticipated levels of funding were too meager. While we were preparing our program plan and budget request for the third year, the Center's USOE project officer in Washington, DC, encouraged us to discontinue the projects because of developments in USOE after the Wisconsin Center started in 1964. USOE was now funding other organizations in the area of re-education. USOE now had its own substantial media program. Last, Titles I and II of the 1965 Elementary and Secondary Education Act provided extensive funding of educational programs for the culturally disadvantaged, and a regional educational laboratory was addressing this area as its primary concern (Klausmeier & Goodson, 1967, pp. 1–6).

Having now established a more realistic mission, we started the 1966–67 academic year with enthusiasm and vigor. Moreover, the national mood relative to educational R & D was most favorable following the passage of the Elementary and Secondary Education Act of 1965. This Act started a new era in federal support of elementary and secondary schooling. It provided a large amount of money for the education of culturally disadvantaged children, and it greatly increased the funds for educational R & D. President Lyndon B. Johnson and Congress

thought that educational R & D could contribute significantly to the improvement of public schooling. We at the Wisconsin Center shared this belief.

PROGRAMMATIC RESEARCH, PRODUCT DEVELOPMENT, AND IMPLEMENTATION, 1966-1976

From 1966 to 1971 the Center extended its programmatic research on learning and teaching concepts to include learning and teaching problem solving and other areas of the cognitive domain. Four teams started to develop programs and instructional materials in mathematics, pre-reading, reading, and motivation; however, they did not complete the programs until after 1971. A team that I led developed an alternative form of elementary schooling called Individually Guided Education (IGE). In 1971 USOE selected IGE for nationwide implementation. Thus, 1966–71 was a formative period of programmatic research and product development, but there was no federally funded implementation. The Center's annual federal and state budget remained about $1.4 million annually from 1966–67 onward.

Starting in 1972 the Center's activities focused on IGE. Funding for the years 1972–76 was at about $2.6 million annually. In accordance with a new 1972 USOE policy, the Center changed its work organization from a few programs to many programs. Programmatic research continued at about the same level from 1972 through 1976. The development of the curricular and other programs accelerated markedly; all of these programs were completed between 1972 and early 1977. Implementation of IGE and the curricular programs, as they became available, proceeded nationwide through December of 1975. These years were highly successful in terms of educational product development, implementation, and school improvement. Moreover, the outcomes of the Center's programmatic research from 1966 onward, in the form of original findings, summaries, and theories, were published in hundreds of Center publications, journal articles, and books. Thus, the Center moved far in achieving its mission of educational improvement through research, development, and implementation.

Center name and directors

Wisconsin R & D Center for Cognitive Learning, 1967–76	
Herbert Klausmeier, Director	8/67 – 9/72
William Bush, Interim Director	9/72 – 1/73
Richard Rossmiller, Director	1/73 – 8/80

Funding Information for 1966-76

Period	Amount	Source	Purpose
7/1/66–6/30/76	$ 1,438,055	State	Programmatic R & D
7/1/66–6/30/76	16,647,963	USOE	Programmatic R & D
7/1/66–6/30/72	168,400	National Science Foundation	Mathematics R & D

7/1/66–6/30/72	42,758	USOE	Research Equipment
6/29/70–7/31/71	98,000	USOE	Field Test of *Patterns in Arithmetic*
6/25/70–12/25/71	11,000	USOE	Dissemination of information about *Patterns in Arithmetic*
12/1/71–5/31/73	250,000	National Center for Educational Communications	IGE Implementation
7/1/71–5/31/73	750,000	Bureau for Education Professions Development	IGE Implementation
7/1/73–12/31/75	637,827	National Institute of Education	IGE Implementation
9/1/74–8/31/76	821,004	Bureau for Education of the Handicapped	Specialized Office 3 Project*
1/15/75–8/31/76	36,468	National Science Foundation	Mathematics R & D

*The Specialized Office 3 Project was concerned with locating instructional materials that might be used in educational programs for children having exceptional educational needs and with evaluating the quality of the materials. Information about the materials was then entered in a national data bank.

The above funding periods differ in length of time from 13 months to 10 years and in beginning and ending months. Relative to length of time, I summarized the annual budget information to include all the years during which both the source of the funding and the purpose of the funding did not change. For example, the funding from the state of Wisconsin had the same purpose across the 10 years. The differences in the beginning and ending months reflect either the fiscal year of the funding agency or the first and last month of funding for the purpose indicated. We might notice, too, that there were four sources of funding in addition to the state, USOE, and the National Institute of Education. Each new source was for a specific purpose, and the funding period was quite short. The support from the National Center for Educational Communications, the Bureau for Education Professions Development, and the National Science Foundation contributed directly to the Center's goal of improving elementary schooling. The Specialized Office 3 Project marked the beginning of Center activity that departed sharply from the primary focus on elementary schooling.

From 1966 to 1972, the Center carried out work related to four programs (Klausmeier & Goodson, 1967, pp. 7–871). The projects of each program that were completed before 1972 are marked *; those completed in 1972 or later, **.

1. **Conditions and Processes of Learning**

   Rule Learning*. Computer Simulation of Concept Attainment*. Creative Problem Solving*. Concept Learning**. Language Concepts and Cognitive Skills (this later became the curricular program *Pre-Reading Skills*)**. Peer Group Pressures on Learning**.

2. **Processes and Programs of Instruction**

   The ITV curricular program *Patterns in Arithmetic**. English Language and Composition*. Science*. Verbal Concepts in Speech*. Analysis of Mathematics Instruction (this later became the curricular program *Developing Mathematical Processes*)**. Reading (this later became the curricular program *Wisconsin Design for Reading Skill Development*)**.

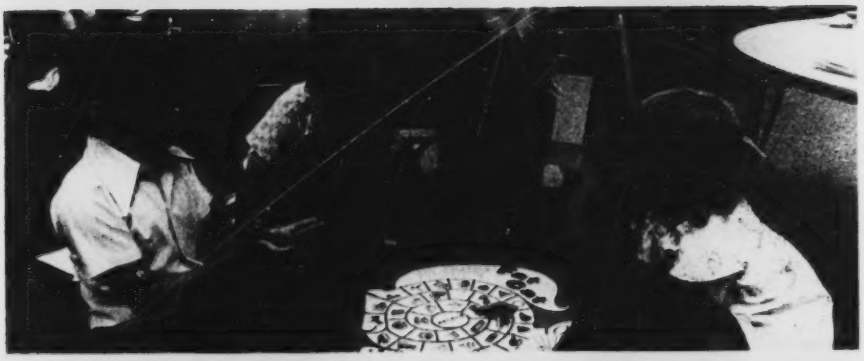
3. **Facilitative Environments**

   Maximizing Opportunities for Development and Experimentation in the Schools (Project Models)*. Effecting Planned Educational Change*. Educational Effectiveness of Reorganized School Districts*.

4. **Dissemination and Implementation**

The scope of work increased markedly in 1966–67, and three support sections were organized (Klausmeier & Goodson, 1967, pp. 88–93). The Business and Operations Section assisted the Center staff in planning, budgeting, and accounting and provided services of all kinds, including housing arrangements, copying, travel, and supplies. The Technical Section provided assistance with product development, including test construction and field testing. The Dissemination and Implementation Section worked with the Center researchers and product developers in transmitting information about research findings and products to other researchers and practitioners and in getting the products into the schools.

Relative to the continuing projects of Program 1, the research on concept learning eventuated in the first version of a theory of concept learning that I reported in my Presidential Address to the Division of Educational Psychology of the American Psychological Association in 1971. From 1972 to 1976, assisted by successive research teams, I refined the theory through two longitudinal studies, one dealing with the course of cognitive development during the school years, the other with the teaching of concepts. The continuing research project dealing with peer pressures on learning examined successive sets of variables, such as the effects of the tutor's attitudes on the tutee's attitudes and performance. Professors and their assistants who completed their projects before 1972 reported their research to the educational research community and to practitioners and students.



Research, development, and implementation, 1966–76, centered on extending knowledge about learning and teaching and improving elementary schooling. Improvement occurred as teachers participated with school administrators in educational decision making and arranged an excellent program of one-to-one, pair, cooperative small-group, and large-group learning activities for each child.

For example, *Saturday Subway Ride*, a fascinating and widely used book for children came from the project on creative problem solving.

The two projects of Program 2 that continued after 1972 eventuated in research, development, and implementation projects. The other four projects of Program 2 were completed before 1972. As we shall see later in this chapter, the televised lessons of *Patterns in Arithmetic* reached many children across the nation. The other three projects that were completed by 1972 were reported in articles and Center publications. The most important outcome of each of these projects was a prototype instructional program, for example, in speech. Any person was encouraged to use these programs in subsequent curricular development. In sum, both Programs 1 and 2 were characterized by high productivity from 1967 to 1971 (Klausmeier, 1970, pp. 17–43; 1971a).

We now consider Program 3. All three projects were completed by 1972. The ones dealing with planned change and reorganized school districts started before 1966 and terminated with final reports that did not call for further research. Project Models, however, had a central role in determining the course of the Center's work from 1966 onward (Klausmeier, Goodwin, Prasch, & Goodson, 1966). Our project group, assisted by the Center Technical Section, worked with schools of four Wisconsin school districts from 1965–66 to 1971–72. Out of this cooperative effort came an alternative approach to conventional elementary schooling, first called the Multiunit School-Elementary, then Individually Guided Education in the Multiunit Elementary School, and later Individually Guided Elementary Education (IGE). Aided by many Center personnel and educational practitioners, I conceptualized IGE in terms of seven components. Center teams developed each component cooperatively with school practitioners. Two components that had been developed through Project Models and were functioning quite well in 1967–68 in schools of the four districts were an administrative-organizational arrangement called the multiunit school and an instructional strategy, referred to as a model of instructional programming for the individual student (IPM).

Center teams starting in 1967–68 developed the other five components and conducted research related to them. One component included curricular/instructional programs. As of 1967–68 programs in reading, mathematics, pre-reading, and motivation were in the early development stages. Evaluation, a fourth component, was being developed in connection with the curricular programs. The other three IGE components were a program of home-school-community relations, facilitative environments, and continuing research and development. The Center had not conducted systematic R & D relative to any of them as of 1971–72. Thus, much work related to these components and the curricular programs remained to be done. Monies were scarce, as usual, in terms of the amount of work to be done. This being the state of affairs we organized our R, D, & I activities around the IGE theme for the period 1972–77 (Klausmeier, 1972b; Klausmeier, Rossmiller, & Saily, 1977).

The programs that we planned for the five-year period 1972–77 and the projected completion dates follow (Klausmeier, 1972b):

1. Children's Learning and Development, 1977.
2. Conditions of School Learning and Instructional Strategies, 1977.
3. Organization for Instruction and Administrative Arrangements, 1975.
4. Research Feasibility Studies, 1974.
5. *Developing Mathematical Processes*, 1976.
6 *Wisconsin Design for Reading Skill Development*, 1976.
7. *Pre-Reading Skills Program*, 1974.
8. *Individually Guided Motivation*, 1974.
9. Computer Applications for IGE, 1977.
10. Models for Individually Guided Education in the Multiunit School–Secondary, 1976.
11. Product Development Feasibility Studies, 1975.
12. Product Implementation, 1976.

Programs 1 and 2 were extensions of the programmatic research being conducted in earlier programs on learning and instruction. Some of the projects in each program were already under way in 1972 and others were new. Program 3 was a new area of research that grew out of Project Models. Professors of educational administration joined the Center for the first time and started systematic research in the areas of elementary school organization and administration, home-school-community relations, and support arrangements for IGE schooling. Programs 5, 6, 7, and 8 continued the development of the four curricular/instructional programs that had started earlier. Program 9 was new; it involved the development and then the demonstration of a program of computer management of instruction. In the demonstration schools, a computer kept track of each student's progress in attaining a school's instructional objectives in reading and other subjects. Test items for each objective could be accessed by use of the school's computer terminals. Program 10 was a small exploratory project. The researchers found that middle schools could readily adapt and implement the IGE components that had been developed at the elementary school level. High schools could not implement the individual instructional programming model nor arrange for teacher participation in educational decision making without departing from their departmental organization and administrative arrangements. The feasibility studies were conducted to find out what else might be needed to complete the IGE program and might be started if funds became available. With minor exceptions, the Center staff completed these 11 programs on schedule (Rossmiller & Otto, 1977, pp. 2–13).

Regarding Program 12, Product Implementation, USOE selected the multiunit school organization and the instructional programming model of IGE for nationwide implementation to start in 1971–72 (Klausmeier, 1971). This preceded the formulation of a five-year program plan and a budget request for 1972–77. This five-year program plan and a budget for 1972–77 were approved by the National Center for Educational Research and Development in early 1972. With this approval, I resigned as Center Director, effective September 1972, to be able to devote more time to research on concept learning and to direct the IGE Teacher Education Project (Klausmeier, 1972a). I had received funding for this project from The Sears-Roebuck Foundation.

Shortly after the approval of the five-year plan by the National Center for Educational Research and Development, the National Institute of Education superseded it. The policy of NIE from 1972 to 1978 was to purchase only programs of R & D centers and regional educational laboratories, not their total programs, as had been done from 1964 to 1972 (Frye, 1972). Starting in 1973, Center Director Richard Rossmiller prepared budget requests and management plans to secure funding for each of the Center's programs. Agreements on funding were not easy to negotiate; however, NIE funded all 12 programs included in the 1972–77 five-year plan (Rossmiller & Otto, 1977, pp. 219–230). NIE officials hesitated to discontinue any of them inasmuch as IGE, more than any other educational product developed with federal funding, gained favorable attention from chief state education agency officials, school district personnel, and Congressmen in the many Congressional districts where IGE was being implemented.

Before proceeding further, we return to the 1972–77 programs of research and product development. Center professors carried out research of the highest practical and theoretical significance on children's learning and development and on conditions of school learning and instruction. This research was as applicable to education in general as it was to IGE schooling. In fact, IGE was rarely mentioned in the reports of the research, including those that I wrote. And while professors conducted the research on school administration and the organization for instruction mainly in IGE schools, it, too, was highly relevant to elementary schooling in general. All four of the curricular/instructional programs had a large research component. The research on mathematics learning and pre-reading skills, as well as that in the other two areas, advanced knowledge remarkably in these fields. These advances in knowledge may well have more lasting effects than the educational materials that were developed.

Another point is in order regarding the curricular/instructional programs. All four were designed to be compatible with the individual instructional programming component of IGE; however, each one differed from the others in the particular application of the component. In fact, to the concern of practitioners, each program required its own inservice program. Moreover, while designed to be usable in IGE schools, the instructional materials could be used by any teacher who could adapt instruction to the educational needs and other characteristics of the individual student.

PROGRAMMATIC RESEARCH ONLY, 1976-1985

In the period from 1966 to 1976 the Center staff conducted programmatic research, developed curricular programs and materials, and from 1971–72 to 1976 led the nationwide implementation of IGE. We might characterize the Center's 1966-76 activities as being both programmatic and integrated. The Center in fact carried out the 1963 USOE Centers Program charge of concentrating "human and financial resources on a particular problem area in education over an extended period of time in an attempt to make a significant contribution toward an understanding of, and an improvement of practice in, the problem area." From 1976–77 to 1980 the Center carried out programmatic research only. In 1978 NIE again started purchasing the complete Center program rather than its individual programs. Thus, from 1977 to 1980 the Center changed markedly from what it was from 1966 to 1976, including its name in 1977. Programmatic research and dissemination continued to 1985; however, a sharp change in the mission of the Center and an accompanying change in its name occurred in 1982. The annual funding was about $2.3 million.

Center names and directors

Wisconsin Research and Development Center for Individualized Schooling, 1977–82
Wisconsin Center for Education Research, 1982-present

Richard Rossmiller, Director	1/73 – 8/80
Wayne Otto, Associate Director	7/76 – 5/78
Co-Director	6/78 – 1/80
Marshall Smith, Director	8/80 – 7/86

Funding information for 1976-85

Period	Amount	Source	Purpose
7/1/76–11/30/77	$ 450,000	Bureau for Education of the Handicapped	Specialized Office 3 Project*
7/1/76–6/30/85	1,587,517	State	Research and Dissemination
7/1/76–11/30/85	19,524,982	National Institute of Education	Research and Dissemination
10/1/81–9/30/85	463,687	Office of Education and Special Rehabilitative Services	Autistic Children**

*For information, see note on page 10.

**Educational leadership preparation program in severe communicative/behavioral disorders; the program was designed to prepare students as leaders in nonaversive behavior management.

Several factors led to major changes in the Center's mission and programs starting in 1976–77. By 1977 the Center staff had completed nearly all of the research, development, and implementation activities that had been built into the 1972–77 program plan. The previously mentioned NIE policy of purchasing individual programs rather than the Center's total program did not seriously interfere with the Center's completion of its 1972–77 work. However, a new USOE policy affecting all the federally funded R & D centers and regional educational laboratories hit the Wisconsin Center especially hard. In 1976 USOE discontinued the funding of curricular development on a nationwide basis (Schaffarzick & Sykes, 1979, p. 338). This ruled out the possibility of the Center developing much needed curricular programs in science and other fields. Moreover, revision of the curricular materials that came out of the Center's earlier efforts was not possible. On a second front, NIE support of the implementation of IGE ceased in December of 1975. Policymakers apparently felt that IGE was institutionalized. And, without funding for curriculum development or implementation, the Wisconsin Center entered a transitional period of becoming a research-only center.

One of the first actions in this direction was to change the Center's name to the Wisconsin Research and Development Center for Individualized Schooling. The research-only role is reflected in the six programs of research included in the Center's five-year plan for 1977–82 (Rossmiller & Otto, 1977, pp. iii–ix). One program continued the research focus on learning and child development. Research in reading, language, and communication was a second and very large program. Another program continued the studies of administration and organization for instruction. A fourth program called for studies in mathematics, and a fifth one for studies of the implementation of individualized schooling. The sixth program, evaluation of practices in individualized schooling, was new.

Most of the studies started in 1977 as planned. Researchers affiliated with the Center during the preceding years led most of them. The research in the first five programs extended knowledge in areas that had been studied earlier. Some of the research was directed toward refining IGE practices; however, there was no mechanism for getting the refinements into IGE schools. In fact, the sixth program, the evaluation study, was designed to determine how well IGE practices were being implemented nationwide and how effective they were, not to aid IGE schools in refining or institutionalizing the practices.

The Center's individualized schooling focus for 1977–82 did not meet NIE objectives fully. In 1979, Patricia Graham, then Director of NIE, invited the Center to engage in a year of planning and strengthening directed toward examining the mission of the Center, sharpening the Center's focus, addressing research functions that had been specified for the national R & D centers, and increasing participation of women and minorities in the work of the Center (Smith, 1980, p. 4). In this regard, in 1978–79 national committees evaluated all of the R & D centers and regional educational laboratories that NIE was then funding. These evaluations provided the basis for determining which ones would receive long-term funding under the new NIE long-term program purchase policy.

The mission that resulted from the year of planning by the Center focused on student diversity (Smith, 1980, pp. 13, 14). The Center proposed to study "educationally significant diversity among students from four basic perspectives, seeing diversity as simultaneously a basic fact of human nature, a central challenge for educational techniques, a key issue in the relations between individuals and institutions, and a fundamental question in American social thought." Relative to the first perspective, Center researchers would "identify the most salient ways in which students differ in basic learning processes and then attempt to understand the roots of this diversity in the learner, in the home, and in our languages and cultures." Going beyond this basic area of diversity, the Center staff would look at students in relation to the activities and the structure of the classroom. Here the aim was "to identify and evaluate those techniques and forms of interaction which are most appropriate to the variability in students." Moving beyond the classroom, the mission was to examine student variability in relation to the larger context of the school as an institution, "to understand the values and the structure of the institution as diverse students encounter it: the meanings which the institution assigns to diversity and the meanings which the students assign to the institution." The final perspective focused on understanding "the diversity of students in the context of our social values and policies at every level, from the nation to the neighborhood."

In line with this mission, the Center's activities changed markedly after 1980 (Smith, 1980, pp. 73–797). We get a glimpse of how the mission was translated into action by examining the Center's four programs and the number of professors conducting projects during the period 1980–84 (Smith, 1980, pp. 5–48). All of the professors had one or more research assistants. One program centered on student diversity in learning and development. Six professors conducted research on language development and cognitive processes; three on metacognition; and one on language disorders. In the second program, student diversity and classroom processes, five professors studied skill development; four studied classroom interaction and organization; and five conducted research on technology in the classroom. Nine professors investigated student diversity and school processes at the elementary school level, and five other professors studied the secondary level. Relative to student diversity and social policy, seven professors conducted research on federal, state, and local roles in policy formation; and three studied historical perspectives and the education of minorities.

The many different projects of each program were of varying duration. Some were in progress in 1980; others started after 1980. The 48 professors who conducted the research held appointments in 16 different departments of four different colleges or schools of the University; about half of the professors did not have prior affiliation with the Center. Nearly all of them had already established reputations as distinguished researchers. Their common interests were student diversity and education.

ENTERING A NEW ERA, 1985-1989

Nothing is more important to the future of our country than the quality of education our children receive. The Wisconsin Center for Education Research is making an important contribution to Wisconsin and the country through its activities. While the Center is now twenty-five years old, the research conducted there is becoming more critical. A major portion of our country's resources are devoted to public education, and yet relatively little of that funding is devoted to research. As our nation becomes more racially and culturally diverse, the demand for a highly educated citizenry increases. We are proud to have the Wisconsin Center for Education Research as a part of our university. We expect the Center to continue to address state and national issues for the next twenty-five years.

UW Chancellor Donna Shalala, 1989

The Center was in transition from 1977 to 1980–82 and then experienced stability for three years. However, during December of 1985 and the next year or two the Center changed more in some ways than it had in the 21 years from 1964 to December of 1985. The number of separate programs and projects and the kinds of activities multiplied phenomenally. Large research programs of the kind carried on from 1982 to 1985 continued. Other projects started that focused on product development, demonstration, training, implementation, monitoring and evaluating non-Center programs, coordinating projects external to the Center, and service. The home and the neighborhood, as well as the school, became primary research targets.

Center name and directors

Wisconsin Center for Education Research, 1985-present	
Marshall Smith, Director	8/80 – 7/86
Carl Kaestle, Director	7/86 – 7/88
Andrew Porter, Director	7/88 – present

One of the last acts of NIE in 1985 before it was superseded by the Office of Educational Research and Improvement led to NIE, rather than university, formulation of center missions and programs. As a consequence, the Wisconsin Center for Education Research ceased as a federally funded center with a mission that UW personnel conceptualized and carried out. Instead, it became a loosely coupled R, D, & I organization consisting of an overall administrative unit and many independently functioning centers and projects. As of 1989, these centers and projects had many different sources of funding, including federal, state, private foundations, and others. The overall administrative unit was funded by

monies from the School of Education and by overhead monies from some of its centers and projects. As a general rule private foundations did not contribute overhead funding.

NIE's greater control of the national R & D Centers Program is clearly described in a document that invited applications for being awarded a center (National Institute of Education, undated, pp. 1–5). Here we find that NIE had identified 11 missions. Each mission would serve as the basis for establishing a *research center*, not a *research and development center*, that would carry out research and dissemination activities for five years. NIE assigned each center a name to reflect the mission and indicated its annual and total five-year funding. Universities and other organizations were invited to compete for each center.

One of the 11 centers was the NIE National Center on Effective Secondary Schools (National Institute of Education, undated, pp. 45–50). Notice that it is an "NIE Center," not a university's center. NIE specified an annual budget of $1.0 million for this center, $5.0 million for five years. NIE indicated this center's mission, outlined illustrative research questions, and suggested a research strategy. Ideas about organization and staffing, dissemination, and leadership activities followed. The concluding remarks indicated how this center should relate to other NIE centers. The NIE mission statement specified that the center should particularly address the secondary school's handling of students with special problems or disadvantages and orient its work toward aspects of schooling that were alterable at the school level.

I draw from the Wisconsin Center's successful application to see how NIE's guidelines were followed. We start with the mission (Newmann, 1985, p. 7). Newmann indicated that the mission of the National Center on Effective Secondary Schools (NIE was dropped from the Center's name when OERI superseded NIE) would be to learn how secondary schools can improve the academic achievement of all students, but that special attention would be given to needs of disadvantaged and less successful students. He indicated that research directed toward improving academic achievement would be guided by three assumptions:

> (a) that the conception and measurement of appropriate forms of achievement are themselves problematic and the mission should not be construed simply as increasing student scores on tests currently in use; (b) that the mission should be approached not simply by looking for relationships between generalized school inputs and student achievement, but, more importantly, by trying to understand how to increase student engagement in academic work; and (c) that, although conditions and policies beyond the school have major effects on student achievement, more attention must be given to levers at the school site, that is, the strategies that teachers and administrators can use to alter specific conditions within schools to improve students' engagement and achievement.

The primary work of the Center, following NIE suggestions quite closely, would be conducted in five program areas: academic achievement, higher order thinking, at-risk students, staff (secondary) working conditions, and school change (Newmann, 1985, pp. 11–16). The plans stated in the application regarding dissemination, evaluation of progress, and collaboration with practitioners and other R & D organizations were in line with the NIE suggestions.

My observation is that the Center implemented the programs and procedures as outlined in its application. Fred Newmann, Director, and Gary Wehlage, Associate Director, give more information about this Center in chapter 3.

NIE established similar policies and control with respect to the regional educational laboratories. Funding for all of the existing laboratories ceased in 1985 except as they were able to compete successfully for five-year funding. In 1989 the Office of Educational Research and Improvement, the successor of NIE, identified missions that would serve as a basis for establishing 12 research centers in 1990 (Office of Educational Research and Improvement, 1989). Very few of the 1985 centers established by NIE were included in the set to be funded in 1990.

We now turn to the Wisconsin Center for Education Research and examine brief information regarding its several Centers and projects.

The WCER central administration (1990) provided campus-wide educational research leadership and aided Center projects in many ways, starting with identifying sources of funding and continuing through the publication of final reports. (Clockwise, Karen Donnelly and Lois O'Brien Opalewski, secretaries; Andy Porter, director, Debbie Stewart, senior editor; Ed Frederick, public information; not shown, Al Divine, design and graphics.)

The Business Office staff (1990), headed by Jerry Grossman (second from left), provided building management, budgeting, accounting, and personnel services to Center researchers, services not usually available to educational researchers.

The copy/mail shop staff (1990), headed by Maureen Ormson (center, group photo), were as helpful in copying a page as in producing copies of a monograph and then binding and mailing them.

Funding information for 1985-90

Period	Amount	Source	Purpose
7/1/85–6/30/90	$ 871,777	State	General Center Support
12/1/85–11/30/90	5,479,995	OERI	National Center on Effective Secondary Schools
12/1/85–11/30/90	1,603,531	OERI	Center for Policy Research in Education
12/1/85–11/30/90	163,362	OERI	Teacher Education Research Center
12/1/85–11/30/88	248,840	OERI	Postsecondary Finance and Leadership Research Center
10/1/87–9/30/90	1,490,000	OERI	Center for Research in Mathematical Sciences Education
10/1/86–9/30/90	2,416,704	Office of Bilingual Education and Minority Language Affairs	Upper Great Lakes Multifunctional Resource Center
9/1/85–8/31/90	1,324,164	NSF	Cognitively Guided Mathematics Instruction
7/1/89–6/30/90	182,348	NSF	Reform Up Close
9/1/89–8/31/90	208,754	NSF	Research on Science Teaching and Learning
9/1/89–12/31/90	465,000	Public Health Service	National Study of Young Children's Lives
9/1/84–8/31/92	303,250	Spencer Foundation	A Social History of the American Reading Public
1/1/85–12/31/90	1,537,831	Ford Foundation	Urban Mathematics Collaborative Documentation Project
7/24/88–6/30/90	560,461	Casey Foundation	New Futures Initiative
7/1/88–6/30/90	141,854	State	Madison Plan: Partners in Improving Children's Achievement
11/1/88–10/31/90	180,811	Spencer Foundation	Increasing the School Achievement of Low-Income Minority Children Through Improved Home-School-University Collaboration
1/1/89–12/31/90	298,122	Pew Charitable Trusts	Master's Degrees in the United States
7/1/89–6/30/90	73,470	State	Upward Bound

9/1/89–8/31/90	140,000	Office of Postsecondary Education	Upward Bound
9/1/89–12/31/90	357,500	Various sources	Effective Schools Center
9/1/85–12/31/90*	2,094,787	Various sources	Various purposes

*This entry is for eighteen projects of $10,000 to $333,747 that started and ended at various times from 9/1/85 onward. Nearly all were completed on or before 8/31/88.

The centers and the various projects have different missions and carry out different activities. Brief information follows that gives the main kinds of activities of each one.[5]

The National Center on Effective Secondary Schools is funded by the Office of Educational Research and Improvement (OERI), U.S. Department of Education. The Center's mission is to explore ways secondary schools can improve the academic achievement of all students, with special attention to the needs of the disadvantaged and less successful students.

The Center for Policy Research in Education is supported by a subcontract with the Rutgers University Policy Research Center, funded by OERI. The goal of the Center is to improve the quality of schooling in America through research into state and local educational policy.

The Center for Research on Teacher Education is supported by a subcontract with the Michigan State University Teacher Education Center, funded by OERI. The goal of this project is to investigate the purpose, process, quality and impact of teacher education programs, with a focus on mathematics and writing. Eleven sites are under study by this national project.

The National Center for Research on Postsecondary Finance and Governance was supported by a subcontract with the national center at the University of Maryland, funded by OERI. The researchers focused on issues of financing in higher education and on the effects of different financing approaches.

The National Center for Research in Mathematical Sciences Education is funded by OERI. The purpose of this three-year Center is to foster research that will ultimately lead to the improvement of school mathematics.

The Upper Great Lakes Multifunctional Resource Center is funded by the Office of Bilingual Education and Minority Language Affairs, U.S. Department of Education. It is one of 16 regional resource centers. These centers provide training and technical assistance to parents, educators, schools, and programs involved in educating students of limited English proficiency.

A Longitudinal Analysis of Cognitively Guided Instruction and the Primary School. This five-year study, funded by the National Science Foundation, examines the effects of Cognitively Guided Instruction on primary school children's mathematics learning over several years and across multiple content areas, such as multiplication, division, and geometry.

Centers and projects, 1985-90, varied greatly in size and R, D, & I activities. The National Center on Effective Secondary Schools, Fred Newmann (left) and Gary Wehlage (right), co-directors, had a staff of 8 professors, 12 graduate student research assistants, 5 academic staff, and 4 secretaries. The Center conducted research to find ways of improving academic achievement and disseminated information by printed means, conferences with practitioners, and networks of schools and professional organizations.

Cognitively Guided Instruction had a staff of 3 professors, 5 graduate student research assistants, and 1 secretary. They conducted research, developed instructional strategies, and worked with primary schools in implementing the strategies.

The Center for Policy Research in Education, William Clune, director, was staffed by 2 professors, 2 academic staff, 3 graduate student research assistants, and 1 secretary. They conducted research on state and national educational policy and disseminated the findings to the scholarly community and educational policy makers.

Upward Bound assisted Madison, Wisconsin, low-income high school students whose parents had not gone to college in preparing for college. Upward Bound had a staff of 2 academic personnel, 1 secretary, and 12 graduate students who served as teachers or counselors for the students.

Reform Up Close: A Classroom Analysis. This NSF-funded project is studying how high school mathematics and science instruction has changed in the 1980s as a result of the educational reform movements during the decade.

Research on Science Teaching and Learning. This NSF-funded project identifies the ways in which experienced high school biology, chemistry, and physics teachers think about their discipline, their students, and their teaching and the relationships among the teachers' thinking, their planning and teaching practices, and the conceptual learning of their students.

National Study of Young Children's Lives is supported by the U.S. Department of Health and Human Services. The researchers are assessing the impact of child care choice on the quality of infant-to-parent attachment. The study is also examining the influence of non-parental care on how well children cooperate with adults and comply with their wishes. In addition, the researchers are studying how child care influences a child's regulation of his or her behaviors, problem-solving skills, and peer relationships.

A Social History of the American Reading Public. This project, supported by the Spencer Foundation, is identifying the reading habits and literacy skills of the American public during the last 100 years.

Urban Mathematics Collaborative Documentation. The Ford Foundation is funding 11 urban mathematics collaborative projects in U.S. The purpose of the Documentation project is to monitor the efforts and effects of these projects.

New Futures Initiative. The Annie E. Casey Foundation is sponsoring a program of intervention in medium-sized secondary schools in five cities designed to help keep at-risk students from dropping out. The purpose of this project is to evaluate these interventions and apply the knowledge gained from these efforts to the needs of at-risk students in larger, more comprehensive schools.

Partners in Improving Children's Achievement Through School-University-Community Collaboration. This study, supported by the Spencer Foundation, is investigating whether making a school's environment more culturally compatible for minority and non-minority children can improve the academic achievement of minority children attending that school.

Master's Degrees in the United States. The overall purpose of this study, funded by the Pew Charitable Trusts, is to inquire into master's degree education—its purposes and characteristics, its quality and value, its place and fit with the larger society as well as within colleges and universities.

Upward Bound is funded by the Office of Postsecondary Education, U. S. Department of Education and the Office of the Chancellor of the University of Wisconsin-Madison. The Project reaches out to assist minority and low-income high school students who may not normally consider post-secondary education as part of their future.

The Effective Schools Center receives funding from various sources, including the Olin Foundation. It provides technical assistance to help improve schools and does research on effective schools to increase the knowledge base about effective schooling.

I shall not discuss any of the centers or projects further except to indicate that the first four OERI-funded centers are charter-member centers in the sense of being four of the first 10 established in the nation under the NIE policy of 1985. The Mathematical Sciences Center holds a similar position as one of the first subject-oriented centers to be established under OERI policy. Andy Porter, director of the Wisconsin Center, indicates the relationship between and among the centers and other projects in chapter 6.

DISSEMINATION AND IMPLEMENTATION, 1964-1989

Prior to the opening of the Wisconsin Center and continuing thereafter, many of us were convinced that we could improve schooling nationwide. We were aware, too, that improving schooling meant changing the practices of school personnel. Accordingly, we involved practitioners and the Wisconsin Department of Public Instruction in Center activities in 1964 and thereafter. This involvement was a critical element of the Center's program of dissemination and implementation.

We regarded dissemination as getting information about the outcomes from our R & D activities to specified target groups, and implementation as getting the outcomes put to use in the schools (Klausmeier & Goodson, 1967, p. 4). Our primary dissemination targets were the educational research and scholarly community, school practitioners, and organizations linking the Center and the schools. The linking organizations were state education agencies and, to a lesser extent, teacher education institutions. We tried to establish working relationships with regional educational laboratories but did not experience much success. We sometimes referred to the linking organization as a diffusing agency, responsible both for information dissemination to the schools and for aiding the schools in implementing Center products.

The first Center curricular program, an instructional TV Program, *Patterns in Arithmetic*, was transmitted directly into classrooms. It consisted of 336 fifteen-minute televised lessons and accompanying teachers' manuals and student workbooks for grades 1–6. The program was completed in 1969; the lessons were then reaching some 385,000 children in 18 states (Klausmeier, 1970, pp. 35–37).

Implementation of three components of Individually Guided Education—the administrative arrangements, the organization of teachers and students into instructional units, and the model of instructional programming for the individual student—started in Wisconsin in 1968–69. The Wisconsin Department of Public Instruction led the implementation. In 1971 USOE selected these components for nationwide implementation (Klausmeier, 1971). Federal funding of

this implementation started in July of 1971 and continued through December 1975. Implementation of the various curricular and other components of IGE proceeded from 1971 into 1975–76 as the components became available. The federal funding for implementation was about $500,000 each year into December 1975, except for 1973–74 when it was only $136,000. This cutback had a serious lasting negative effect on the implementation as will be elaborated in chapter 2. The Sears-Roebuck Foundation provided $1.1 million for developing inservice and preservice IGE teacher education materials and $240,000 for establishing State IGE Networks, 1972–76 (Klausmeier, 1972a). The materials and the establishment of the Networks were intended to facilitate first the implementation and then the institutionalization of IGE. From December of 1975 onward the Center did not receive funds for implementation at a level approaching that for IGE. However, there was some implementation related to the Wisconsin Design for the Renewal and Improvement of Secondary Education (WRISE) from 1979–80 into 1983–84. In chapter 2, I give a more complete account of the development and the implementation of IGE and WRISE.

As of 1989–90 all of the centers and larger projects of the Wisconsin Center for Education Research had programs of dissemination designed to get information to scholars, practitioners, or both. Two centers focused on getting research-validated processes and structures implemented, not only in the school, but also in the home.

Across the years we gained much experience regarding dissemination. Some of the most effective means of getting information to the scholarly community involve journal articles and books, Center newsletters and other Center publications, presentations at national and international conventions and workshops, and interinstitution collaboration in R & D activities. Conferences and workshops involving face-to-face interaction, networks of school and other educational agencies, audio-visual and audio techniques, and printed implementation guidelines are effective in reaching potential implementers in the schools. The most direct means of influencing educational practice is to get instructional materials into the hands of students. As should be expected, materials intended for teachers or principals are not received well if the programs they are designed for require considerable inservice education or more work.

BRICKS AND MORTAR

Title IV of the Elementary and Secondary Education Act of 1965 provided for the establishment of regional educational laboratories and the construction and equipping of educational research facilities. In April 1967, after an extensive USOE review of the Center's operations and a site visit by a tough panel, USOE invited the Center to apply for facilities funding. At this time, $2.74 million in funds had become available from the state of Wisconsin for constructing a building for the School of Education; eventually the state funding amounted to $4,036,694. University and federal officials decided to combine the federal and

state funds and construct one facility. Specified portions of the building were dedicated to three purposes: educational research only; housing research-oriented departments of the School of Education and providing spaces for their research, not instruction; and university instruction, including a truly great multimedia instructional complex that could be used in research on learning and teaching. Federal funding was 100% for the research-only portions of the building.

In June 1969 USOE awarded the University $4,226,792 as its contribution to constructing and equipping an educational research facility; $950,000 was for research equipment.[6] The Center moved into the building in September 1972. More will be said in chapter 7 regarding the work effort from the time of the site visit in 1967 to opening the building in 1972. Suffice it to say here that USOE funding of bricks and mortar did much to institutionalize the federal role in educational research, and it facilitated the conduct of educational research on the UW-Madison campus immeasurably. Moreover, housing instructional departments and the Center in one building contributed significantly to communication between Center personnel and the university community. No longer were we a group operating as a unit in rented space quite far removed from our university colleagues. We had become an integral part of the School of Education and the university community.

Notes

1. The Business Office of the Wisconsin Center for Education Research or the UW Business Services, unless otherwise noted, provided the information in this chapter regarding the funding of the Wisconsin Center.
2. Research projects supported by USOE that had been completed by six of the eight professors who first affiliated with the Wisconsin Center in 1964 were as follows:

   Julian C. Stanley. Critique of Research on Psychological and Educational Factors in Mental Retardation.

   Herbert J. Klausmeier. An Analysis of Learning Efficiency in Arithmetic of Mentally Retarded Children in Comparison with Children of Average and High Intelligence.

   Burton W. Kreitlow. Longitudinal Study of Newly Formed Centralized School Districts in Rural Wisconsin.

   Julian C. Stanley. Development and Analysis of Experimental Designs for Ratings.

   Thomas J. Johnson. Motive and Trait Correlations of Pupil Schema.

   Frank Baker. Empirical Determination of Sampling Distribution of Item Discrimination Indices and a Reliability Coefficient.

   Burton W. Kreitlow. Re-education of Adults.

Other USOE funded projects were in progress:

   Herbert J. Klausmeier and Chester W. Harris. Strategies of Learning and Efficiency of Concept Attainment by Individuals and Groups.

   Thomas J. Johnson. Some Determinants and Consequences of the Teacher's Perception of Causation.

Small Grant Contract: Chester W. Harris and Marie R. Liba. Component, Image, and Factor Analysis of Tests of Intellect and Motor Performance.

3. The names of people appointed as faculty in the Center are given in the Appendix. All information regarding the number of personnel is drawn from the files of the Wisconsin Center for Education Research.
4. The year of the beginning and ending of projects is drawn from the annual reports of the Center or from Center program proposals and budget requests to USOE or U.S. Department of Education.
5. The information regarding the centers and the projects is drawn from WCER brochures of 1988 and 1989.
6. Letter dated July 3, 1969, to Eugene T. Peterson, Grants Officer, DHEW, from R. H. Lorenz, Associate Vice President for Business and Finance, UW-Madison.

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The UW Educational Sciences Building—a superb research facility that supports professors and graduate students from many disciplines in improving education through research.

2 Improving Elementary and Secondary Schooling

Faith in education as a primary means of eliminating ignorance and poverty has been a part of the American creed since colonial times. This faith rests on a vision of what education might do for every child rather than what it is doing at any given time. This chapter chronicles a 25-year effort to improve elementary education and then secondary education, so that schooling actually does what it might do for more children. Recalling a few trends in American education across the 25 years will help us in interpreting the effort.

The period from 1960 to 1973–74 was one of widespread innovation in education. Many of the innovations focused on improving education through making better provisions for the individual student. The Elementary and Secondary Education Act of 1965 accelerated this kind of innovation. Title III of the Act provided funds to local school districts for innovation. Title IV provided for the establishment of regional educational laboratories and an increase in the number of university-based research and development centers. With this federal support, programs directed toward individualization started and flourished.

In a special publication, the National School Public Relations Association (1971) described the most widely acclaimed programs of individualization, including Individually Guided Education (IGE). The Association indicated that many individualization programs, both large and small, some costing millions of dollars

and some costing almost nothing, had made their way onto the nation's educational scene. The impact had already been so great that "education will never be the same again, regardless of what finally happens." The Association stated that the developers usually referred to the programs as individualized instruction, implying the right of every individual "to acquire an education within the school system in his own way and at his own rate of learning." This meant that the school adapted to the individual student, rather than the other way around. It meant harnessing all the techniques of modern education, communication, and technology to assist the individual toward self-development and self-fulfillment. The Association envisioned "individualized instruction as the wave of the future."

But the national mood changed quickly. The period from 1973–75 to the early 1980s was marked by a tax revolt, the back-to-the-basics movement, and calls for stricter discipline. By 1977 back-to-the-basics was the predominant movement in American education. Brodinsky (1977, p. 522) reported that the movement "irritates some educators, baffles others, and raises high the hackles of still others. Its stirrings put many a school administrator and scholar on the defensive. It is usually led by parents, ministers, businessmen, and politicians. National in scope, it is weak in some parts of the country, strong in others." Brodinsky asserted that, at various times and in different places, back-to-basics advocates had demanded:

1. Emphasis on reading, writing, and arithmetic in the elementary grades. Most of the school day is to be devoted to these skills. Phonics is the method advocated for reading instruction.

2. In the secondary grades, most of the day is to be devoted to English, science, math, and history, taught from "clean" textbooks, free of notions that violate traditional family and national values.

3. At all levels, the teacher is to take a dominant role, with "no nonsense about pupil-directed activities."

4. Methodology is to include drill, recitation, daily homework, and frequent testing.

5. Report cards are to carry traditional marks (A, B, C, etc.) or numerical values (100, 80, 75, etc.), issued at frequent intervals.

6. Discipline is to be strict, with corporal punishment an accepted method of control. Dress codes should regulate student apparel and hair styles.

7. Promotion from grades and graduation from high school are to be permitted only after mastery of skills and knowledge has been demonstrated through tests. Social promotion and graduation on the basis of time spent in courses are out.

8. Eliminate the frills. The *National Review*, a conservative journal, put it this way: "Clay modeling, weaving, doll construction, flute practice, volleyball, sex education, laments about racism, and other weighty matters should take place on private time."

9. Eliminate electives and increase the number of required courses.

10. Ban innovations (a plague on them!). New math, new science, linguistics, instruction by electronic gadgets, emphasis on concepts instead of facts--all must go.

11. Eliminate the school's "social services"—they take time from the basic curriculum. "Social services" may included sex education, driver education, guidance, drug education, and physical education.

12. Put patriotism back in the schools. And love for one's country. And for God.

From the middle 1970s onward, innovative programs that cost more money than age-graded classes, allowed students to talk with one another when in small cooperative learning groups or at learning centers, or that did not use basal textbook series and give students letter grades experienced survival problems.

The report of the National Commission on Excellence in Education (1983) stimulated action by state legislatures and school districts. Three directions in education seemed to be emerging in 1989. One was toward a national program of achievement testing and a national curriculum in each of the various subject fields. A second movement was in an opposite direction, toward more state control and less federal intervention regarding all aspects of public schooling. Still a third direction was toward greater local control and local autonomy. The attempts at improving education described in this chapter reflect the early movement toward individualization and a strong emphasis on local school self-direction in bringing about school improvement.

IMPROVEMENT OF ELEMENTARY SCHOOLING

In 1964 the Center staff committed itself to the improvement of education. But we did not then foresee that many of us would be involved for over 12 years in developing a new approach to elementary schooling, Individually Guided Education, and in leading its implementation across the nation. Our early projects on improving elementary schooling evolved into the most comprehensive program ever undertaken by a federally funded R & D center or a regional educational laboratory. It was the only attempt to restructure a level of schooling in its entirety. Moreover, we developed the IGE components systematically to make

sure that they could be implemented with a reasonable expenditure of time and money and that they would improve schooling.

I stated the goal of IGE as follows (Klausmeier, 1977b, p. 7):

> IGE aims to provide quality education that yields high student achievement, develops the abilities underlying those achievements, and contributes to healthy personality development. This aim becomes a reality in IGE schools that provide an environment in which the individual students learn at rates appropriate to each student and in a manner suitable to each student's learning style and other intellectual and personal characteristics. Students, upon completing IGE elementary schooling, should have achieved higher than in other kinds of schools, should have acquired higher-level conceptualizing skills and other abilities which enable them to continue to learn, and also should have developed healthy self-concepts.

I identified conditions of American elementary schooling in the early 1960s that had persisted for decades and were hindering attainment of the IGE goal (Klausmeier, 1977b, p. 3). Students were required to adjust to uniform educational programs. They were placed in age-graded classes and were expected to attain the same instructional objectives by studying the same graded basic textbooks. Teachers spent nearly all their time with children, leaving little time for planning and evaluating instructional activities. The principal tended to be a building manager rather than an educational leader, the teacher an independent ruler of a classroom rather than a cooperative team member. The staff of each school functioned in relative isolation from other schools. Communication networks for sharing creative ideas, materials, and instructional approaches functioned only sporadically, causing a great loss in educational effectiveness. Parent contacts with the schools were often negative, concerned primarily with problems of school finance or student discipline.

Replacing these undesirable conditions called for a total restructuring of elementary schooling. The restructuring took place gradually, as each of the different components of IGE was developed, tested, and then implemented.

Development of the Components of IGE

> *Individually guided education (IGE) is described as a system, and it is a system of many interrelated components; but it is also a strategy, incorporating many tactics, for attaining educational objectives; and when fully implemented, it takes on an institutional character as a new kind of school. It offers distinctive patterns for the organization and management of instruction and learning environments; it fosters new sets of relationships with other education agencies and with the supporting*

> *community; it incorporates coordinated strategies for continuing evaluation, refinement, and renewal; and it stimulates staff development and curricular innovation. Moreover, IGE stands out as one of the more widely adopted and better implemented of the educational innovations that took shape in the 1960s. The indications are that IGE may take its place among the more constructive of American contributions to the advancement of education.*
>
> *Francis S. Chase, 1977*

I led the conceptualization of IGE from 1965 to 1969, assisted by many Center personnel and school practitioners. Seven components of schooling that differentiate IGE from conventional elementary schooling emerged during these years. The development of the components started between 1965–66 and 1968–69; however, it continued for some of the components into 1976. Two of the components were implemented fully as early as 1968–69, others not completely until 1976. One component is a unit organization of teachers and students for instruction and related administrative arrangements at the school building and district levels. Three components focus on instruction, curriculum, and evaluation. The other three include a program of home-school-community relations, a classroom and school environment that encourages student learning, and continuing research and development to maintain and refine IGE practices and to encourage school self-renewal (Klausmeier, Rossmiller, & Saily, 1977). I shall describe each component in sufficient detail to clarify the main IGE concepts and practices. This clarification is important since IGE was evaluated both before and shortly after 1976, the year that funding of IGE implementation ceased. The results of these evaluations are given later in the chapter. Also, I shall indicate the extent to which practices related to the components were being implemented in late 1989.

Multiunit Organizational-Administrative Arrangements

These arrangements consist of structures and procedures at the classroom, building, and district levels. Establishing these structures and processes involves all of the students of a school, the entire building staff, and district office personnel. The multiunit organizational-administrative arrangements provide a means to an end, better instruction, and are not an end in themselves.

At the classroom level, the Instructional and Research Unit (instructional unit) replaces the age-graded self-contained classroom organization. An instructional unit is composed of 60 to 100 or more students and an instructional team consisting of a unit leader, two to four other teachers, and an instructional aide, a clerical aide, or some combination of instructional aide and clerical aide, full- or part-time. Kindergarten-primary instructional units have fewer children than those at the intermediate level. Schools with as few as 120 to 180 students have fewer students per unit than schools with larger enrollments. Two main functions of the instructional team are to plan, carry out, and evaluate an instructional program for each student of the instructional unit and to serve as informal advisors to

the students of the instructional unit. Other important activities are planning and implementing staff-development activities, participating in preservice teacher education, and planning and carrying out research and development activities.

In 1967–68 seven schools of three Wisconsin school districts for the first time organized all of their teachers and students into instructional units. These schools were then called multiunit schools. In the same year the schools changed their administrative arrangement by forming Instructional Improvement Committees (IICs). The IIC of an IGE school is composed of the principal, the unit leaders, and often a special teacher representative, a parent representative, and the director of the instructional materials center. One main function of the IIC is leading the formulation of the educational objectives of the school, taking into account district and state policies that affect the educational program of the building. Coordinating the activities of the instructional units and arranging for the use of the time, facilities, and resources that are not managed independently by the instructional units are two other critical activities. Unit leaders, as members of the IIC, insure that the viewpoints of the teachers of their instructional units are incorporated in the policies and decisions of the IIC. To the best of my knowledge, the IIC is the first formally organized elementary school administrative arrangement in American education that enables teachers to share school-wide educational decision making with the principal.

The Systemwide Program Committee (SPC) is composed of the district superintendent or a designee, principals of IGE schools and representative principals of other schools, representative unit leaders and teachers from IGE and other schools, and a representative(s) of community group(s). The SPC coordinates the IGE program of the district, taking into account district policies and state requirements. Subject matter coordinators, other specialists within the district, and external consultants participate in SPC meetings when program matters of interest and concern to them are on the agenda.

When working with schools and school districts, I recommended that the unit leader should be a continuing position with extra pay. Three Wisconsin school districts—Janesville, Madison, and Racine—implemented this recommendation for several years starting in 1967-68. I worked with the teacher organizations in these districts to get the additional pay. They accepted the idea of additional pay for additional hours of work, not for leadership.

> *Planned change, evolution in education without revolution—a careful analysis by people who understand the importance of learning and how it happens.*
>
> *Elementary School Principal, Norman Graper, 1971*

Relative to the organizational-administrative arrangements of IGE, teachers gained power through increased educational decision making as members of an instructional team. They had more control over the curriculum for their

students, as well as the instructional objectives and learning activities, than when they taught alone. Establishment of the IIC led to teacher participation in educational decision making at the building level. Membership on the SPC extended it to the district level.

Most teachers valued the increased control over their own work responsibilities and the learning activities of their students. But shared decision making required time for group meetings. Shared decision making and cooperative planning went well when the meetings were conducted during school hours, much less well when before or after school hours.

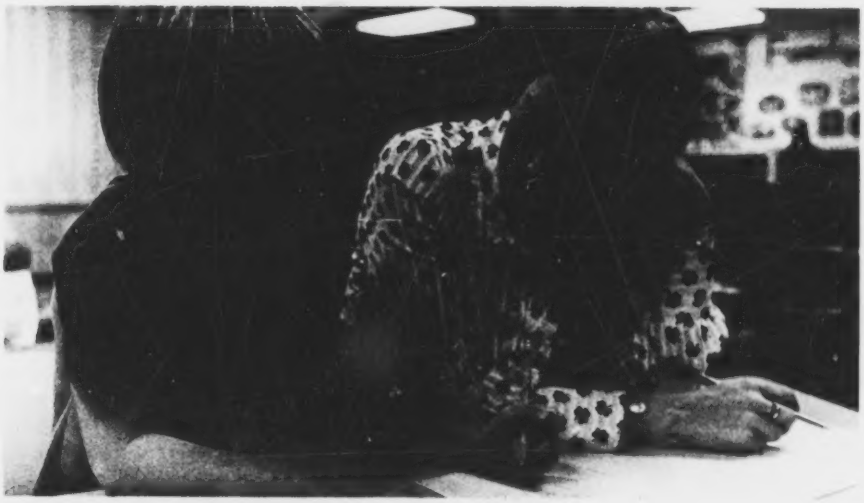
Instructional Programming for the Individual Student

IGE assumes that instruction must be adapted to the needs of the individual student in order to attain desired student outcomes (Klausmeier, 1977a, pp. 55-76). Our early research from 1965 to 1971 showed that teams of teachers could adapt their instruction successfully and by doing so attain desired student performances (Klausmeier, Quilling, & Sorenson, 1971). We incorporated the adaptive instructional practices into a conceptual framework, a model of instructional programming for the individual student (IPM).

The first step in implementing the IPM is for the teachers of an instructional unit to assess the entering achievement levels and the other characteristics of their students. They follow this with identifying instructional objectives appropriate for each student to attain over a short period of time, taking into account the student's characteristics. The teachers then plan an instructional program with each student and implement it. They monitor the student's progress and systematically evaluate the student's performance. The student who attains his/her objectives progresses to the next curricular unit or to enrichment or other activities. The one who does not is retaught or other actions are taken.

Implementation of the IPM varies greatly in relation to three instructional variables: whether all of the instructional objectives of a curricular unit are or are not required of all the students of a group, whether or not all the students must reach the same level of mastery of the objectives, and whether or not the curricular units must be taken in a fixed sequence. The application in art, where each student is to decide what to create that will be personally satisfying and in which there is no fixed sequence of curricular units, is very different from the application in an area of mathematics or science where every student must master all of the prescribed objectives of one unit before proceeding to the next unit in the fixed sequence.

The IPM calls for one-to-one instruction, independent study, small-group activities including tutoring and other pairing, and large-group activities in a combination that is best for each student. It does not specify only whole-class instruction nor only independent study and one-to-one instruction as was incor-



Instructional programming for the individual student—a carefully planned program of individual, pair, small-group, and large-group learning activities, activities that take into account the school's educational objectives and the individual student's learning characteristics.

porated in the first version of Individually Prescribed Instruction, the program of the Learning Research and Development Center at Pittsburgh (National School Public Relations Association, 1971). Rather, the teaching team and individual teachers decide the proper amount of each of the preceding modes of instruction.

Another point pertains to the instructional objectives. How many should there be, for example, in a Kg-Grade 6 mathematics or reading program? The IPM does not specify. I felt that there should be no more than the teachers of an instructional unit would need to guide their planning and teaching. The developers at the Wisconsin Center decided on the number to include in their reading, mathematics, pre-reading, and motivation programs. In general, the developers kept the number of objectives to a minimum. They recognized that a large number of objectives would call for a correspondingly large amount of time to assess the students' attainment of the objectives. Despite this, a considerable amount of testing was called for when a school implemented both the Center's reading program and its mathematics program.

Compatible Instructional Programs and Materials

Today we have excellent curricular programs that facilitate the implementation of the IPM. None were available in the 1960s and early 1970s; none had been developed. During the period from 1966 to 1976 the Center dedicated a great deal of its human and financial resources to curricular development. Large developmental teams were involved as well as members of the Center Technical Section and the Dissemination Section. Three teams developed, tested, and led the implementation of three curricular programs: the *Wisconsin Design for Reading Skill Development* (WDRSD), *Developing Mathematical Processes* (DMP), and the *Pre-Reading Skills Program* (PRS). Another team developed *Individually Guided Motivation* (IGM). The teams developed the programs to be compatible with the IPM and to be readily implemented in IGE schools. I shall describe WDRSD at some length but will give only a brief overview of the other three programs, inasmuch as they are discussed in chapter 4.

I digress briefly to consider federal policy with respect to commercially distributed materials. In accordance with federal policy, WDRSD, DMP, and PRS went into the public domain 10 years after publication. Royalties from the three programs amounted to $696,811 through 1989. Also in accord with federal policy, until 1981 half of the money was returned to the federal government and half was retained by the Wisconsin Center. These monies were placed in a royalty trust fund that had been established from the sale of books that Center authors and editors had produced earlier. In 1978 the Center began using these funds to support small-scale research projects. This funding was continuing in 1990. DMP and WDRSD were being produced commercially but with no ties to the Wisconsin Center. DMP was available from Delta Publications in Nashua, New Hampshire; WDRSD was published by Learning Multi-Systems in Madison.

Wisconsin Design for Reading Skill Development (WDRSD). The WDRSD is organized into six elements: Word Attack, Study Skills, Comprehension, and Self-Directed, Interpretive, and Creative Reading (Otto, 1977). WDRSD includes

instructional objectives for each of the preceding elements and a means for assessing each child's skill development with reference to the objectives. Two other helpful tools for teachers are a comprehensive management system to guide the grouping of children for skill instruction and a plan for monitoring each child's progress.

WDRSD includes no instructional materials to put in the hands of children. The materials for teachers include lists of skills with related instructional objectives and criterion-referenced tests for assessing children's mastery of skills in Word Attack, Study Skills, and Comprehension. Resource files are provided for teachers rather than instructional material for students. These files provide a key to a variety of published materials and activities to teach each skill. Teachers are encouraged to add locally developed instructional materials to the files. Implementation guides are supplied for all six elements of WDRSD.

Evaluation of the six elements during their development showed favorable results. For example, Word Attack was tested during 1970–72 and Study Skills during 1971–73 in 23 schools located in suburban Denver, urban Milwaukee, and other Wisconsin (rural, town, and small city) schools. Children who mastered all Word-Attack objectives could pronounce about 90 percent of a sample of the phonically and structurally regular words on which they were tested. Word-Attack users scored higher on standardized achievement instruments testing skills of the type taught by the Word-Attack program. On standardized instruments that tested the material covered by Study Skills, participating children in every case scored higher than, or the same as, nonparticipating children in terms of grade equivalents.

Word Attack became commercially available in 1972 and Study Skills in 1974, the next three elements shortly thereafter. The Comprehension element was released in early 1977. Rossmiller (1976) reported that more than 4,700 elementary schools in all 50 states were using Word Attack and Study Skills in 1975–76.

Pre-Reading Skills Program (PRS). This program is an instructional package to prepare kindergarten children for learning to read (Venezky & Pittelman, 1977). The program includes three visual skills: attending to letter order, attending to letter orientation, and attending to word detail. There are two auditory skills: sound matching and sound blending. The core of the instructional program consists of small group games designed to teach each of the five skills. Children are assigned to games according to their individual needs. The commercial edition was distributed by Encyclopaedia Britannica Educational Corporation in the fall of 1974. Rossmiller (1976) reported that PRS was in use in more than 2000 schools in 43 states as of December 1975.

Developing Mathematical Processes (DMP). DMP is a complete K-6 mathematics program (Romberg, 1977). The materials for the equivalent of K-2 became available in 1974, 3-4 in 1975, and 5-6 in 1976. Based on the assumption that children learn best by doing, DMP provides the means for applying an activity approach to learning while still meeting the basic objectives of an elementary mathe-

p
re
reading
skills
program

Four innovative curricular/instructional programs – the Wisconsin Design for Reading Skills Development, Pre-Reading Skills Program, Developing Mathematical Processes, and Individually Guided Motivation – programs that reached millions of children, 1965-89.

matics program—acquisition of processes, concepts, and skills needed for problem solving in arithmetic, geometry, and statistics and probability. Rossmiller (1976) indicated that, as of December 1975, DMP was being used in 234 school districts of 38 states and in five foreign countries.

Individually Guided Motivation (IGM). Klausmeier, Jeter, Quilling, Frayer, and Allen (1975) developed IGM during the period 1965 to 1975 to increase children's self-direction and their interest in learning. IGM has four motivational-instructional procedures that can be used separately or together: adult-child conferences to encourage independent reading, teacher-child conferences for goal setting, guiding older children in tutoring younger children, and guiding children toward self-directed prosocial behavior. We developed books, manuals, and films for use in implementing IGM. The Wisconsin Center produced and distributed the IGM materials. The most popular material is the booklet *Tutoring Can Be Fun* (Klausmeier, Jeter, & Nelson, 1972). Prospective tutors use this book and a few copies serve an entire elementary school. Practitioners received this book well here and abroad. I granted permission for its translation into French and German. Frayer gives more information about the program in chapter 4.

A Model of Evaluation for Educational Decision Making

Teachers use this model in evaluating each student's progress in learning and the effectiveness and worthwhileness of each student's instructional program. The school's Instructional Improvement Committee and others employ it in evaluating the effectiveness of curricular programs and the effectiveness of the IGE approach to schooling in its entirety. Practitioners apply it to all domains of instruction—cognitive, affective, and psychomotor. They use it with short instructional sequences of a few weeks duration and with complete curricular programs that extend through an entire level of schooling. Wiersma (1977, pp. 183-236) explains all aspects of the model. Here we examine the most critical aspect, evaluating student progress in learning.

Evaluating student progress in learning involves two steps either before instruction starts or early in the instructional sequence: formulating instructional objectives and then establishing a desired level of attainment of the objectives, such as mastery or a level appropriate for each student. Each student's entering achievement level is assessed at the beginning of an instructional sequence. During instruction, the teacher assesses each student's progress, using work samples, observations, tests, and other devices. The fourth and fifth steps involve relating the results of the assessment to the level of performance desired and judging the extent to which the desired performance is attained. The last step is to decide the actions to be taken with the student.

Use of the model in evaluating students' progress in learning and their instructional programs started in the first IGE schools and continued thereafter. Evaluating curricular programs commenced later as Center teams developed

them. Center and non-Center personnel did small-scale evaluations of IGE prior to 1976. Federal funding for a large-scale evaluation became available in 1976.

Program of Home-School-Community Relations

A school's success in changing to IGE depends in a large measure on parental and community understanding, acceptance, and involvement. Center personnel provided assistance to the first IGE schools in getting these desired conditions. Thereafter, as many schools changed annually, neither Center nor other personnel provided the assistance to many of the schools. Serious problems arose with parents and other citizens in some school districts. The Center responded to these problems by formulating a program of home-school-community relations (Fruth, Bowles, & Moser, 1977). Fruth describes this program and its development in chapter 4.

Facilitative Environments

A safe physical environment and a stimulating intellectual environment are essential for the attainment of desired student outcomes (Walter, Lipham, & Klausmeier, 1977, pp. 292-313). An IGE school's instructional units and Instructional Improvement Committee create and maintain this kind of environment at the classroom and building levels. The district Systemwide Program Committee supports the IGE school personnel in this effort. However, IGE school and district personnel need assistance during all phases of creating and maintaining a facilitative environment in the IGE schools. Most assistance is needed during the first year or two when schools are changing to IGE. From 1968 to 1976 personnel of state education agencies and teacher education institutions provided many kinds of hands-on technical support and inservice education to the IGE practitioners in their states. The Wisconsin Center and other organizations provided the inservice education and technical support to the state education agencies and teacher education institutions that enabled them to work with the schools of their states.

Continuing Research and Development

We developed this component to insure, first, that the early IGE schools were effective and, second, that IGE would continue to be an effective self-renewing form of schooling (Klausmeier, Lipham, & Rossmiller, 1977). Some IGE schools and school districts independently carried on evaluation-type research and developed materials and procedures as part of the IGE schooling process. From 1968 through 1976 many Center personnel and IGE practitioners engaged in cooperative research and in developing the IGE components. A great deal of this research and development is reported throughout this volume.

Implementation of IGE

One of the greatest challenges to an educational R & D organization is to get its products into use in the schools and to insure that the schools use the products in the recommended manner. This is especially difficult in our country since local school districts establish educational policies rather than the states or

the federal government and since school districts do not provide nearly enough time for paid inservice education of teachers. Moreover, it is much more difficult for a complex outcome, such as an alternative form of schooling, than it is for a curricular program, an instructional strategy, or an administrative technique. In a few pages I shall attempt to give the history of the implementation of IGE from the time it came into being in rudimentary form in a few Wisconsin schools until it was in use in more than 2000 schools across the nation.

In 1965–66 a few schools of Wisconsin, working closely with my R & D team, organized some of their teachers and students into instructional units and started to arrange individual instructional programs in one subject field for their students (Klausmeier, 1977b). In 1967–68 seven of these schools, stimulated and aided by the Center team, organized all of their teachers and students into instructional units, formed their schools' Instructional Improvement Committees, and extended instructional programming to more than one subject field. This approach to instruction and the unit organization were referred to as "individually guided education in the multiunit elementary school." Our research with the seven schools during this period showed positive results in terms of both student outcomes and staff job satisfaction (Klausmeier, Quilling, & Sorenson, 1971). We had developed the multiunit organization for instruction, the IIC administrative arrangement, and the instructional programming model to the point that the schools were implementing them effectively and were attaining the intended student outcomes.

> *After consideration of various programs being offered throughout the nation today, we have selected the multiunit school, developed by the Research and Development Center for Cognitive Learning, University of Wisconsin, as having the greatest promise as a facilitative environment for improving the learning opportunities at the elementary level. This design meets all the criteria considered necessary if desired improvement is to be achieved. Within the unit structure provided, both the instructional and learning components support effective use of time, effort, and talent. Roles are differentiated and opportunities are provided for planning, sharing, and evaluation. Provision is inherent in the design to encourage cooperative effort in teacher education and research at the local educational level.*
>
> *William Kahl, 1969*

William Kahl, Superintendent of the Wisconsin Department of Public Instruction and a member of the Center's Policy Review Board, was aware of the development of these IGE components and the positive results that the schools were getting. He and I worked out an agreement whereby the Department, starting in 1968–69, led the implementation of IGE in Wisconsin. The Center and the Department developed the materials and procedures to be used in the implementation (Klausmeier, Morrow, & Walter, 1968). Thereafter, the Center provided only technical assistance to the Department; the Department assumed sole responsibility for working with conventional schools in changing to IGE.

By 1969–70 some 50 schools had changed to IGE, and the number increased markedly in the next years. USOE selected IGE for nationwide implementation to start in 1971. The Center's implementation proposal to USOE called for state education agencies to lead the implementation of IGE in their states (Klausmeier, 1971). Nine state education agencies assumed this leadership role in 1971–72: CO, CT, IL, IN, MN, NJ, OH, SC, and WI; another 14 did by 1974–75: CA, FL, KY, MA, MI, MO, NH, NY, PA, RI, SD, TX, UT, and VA (Rossmiller, 1976).

The federal funding to the Wisconsin Center for IGE implementation left much to be desired. From 7/71 through 5/31/73, the USOE National Center for Educational Communications and the Bureau for Education Professions Development provided $1.0 million. This was excellent; it permitted the Center to provide a small amount of money to each state education agency for leading the implementation of IGE in the state. However, these two federal agencies provided no funds after 5/31/73. NIE awarded the Center only $136,000 for the period 7/31/73 through 10/31/74, and the Center's monetary support to the state education agencies ceased. The state IGE coordinators reacted negatively to this, not fully accepting the fact that the Center could not avoid the loss of funding. NIE again funded the implementation at $501,341 from 7/1/74 through 12/31/75, but nothing thereafter. As we shall see later, IGE was not fully institutionalized in many of the schools of the 23 states at that time. In this regard, personnel of the Wisconsin Center, NIE, and the state education agencies underestimated the time and effort that would be required to institutionalize IGE as an alternative form of self-renewing elementary education in the implementing states.

/I/D/E/A/ of the Kettering Foundation also led the implementation of IGE, first, through a cooperative arrangement with the Wisconsin Center from 1968 to 1971, and thereafter independently. /I/D/E/A/ carried out its implementation through an "IGE Change Program." Center personnel assisted /I/D/E/A/ in developing some of the materials for its IGE Change Program. This Program emphasized the changeover process and the affective domain of student outcomes. It did not include any curricular programs or materials related to some of the other components of IGE. /I/D/E/A/ was actively involved in getting its version of IGE implemented starting in 1970–71 (National School Public Relations Association, 1971), and continuing through 1976.

In 1972 The Sears-Roebuck Foundation funded the IGE Teacher Education Project; the grant was for $1.34 million (Klausmeier, 1972).

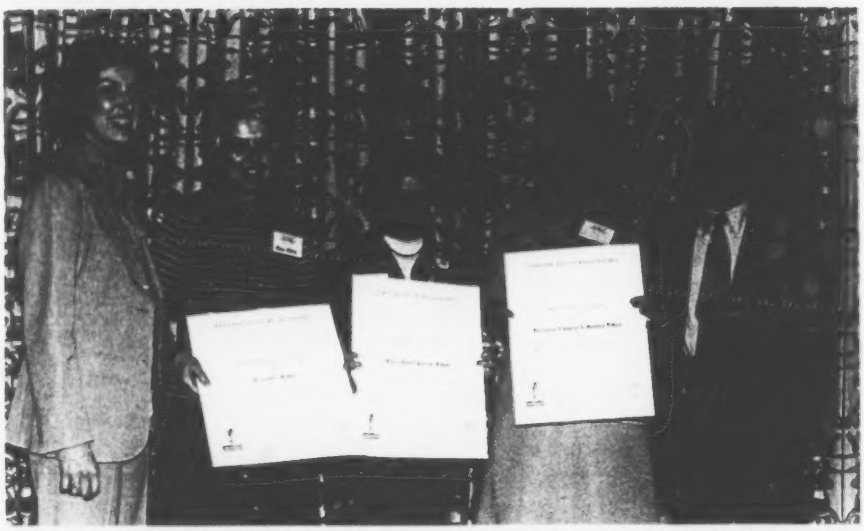
> *There never has been a project in teacher education of the scope and size of the University of Wisconsin/Sears-Roebuck Foundation IGE Teacher Education Project. Print and audiovisuals were all planned as part of a total system to provide authentic information about IGE for school personnel, assist them in developing teaching and administrative competencies, and encourage support from individuals in teacher education institutions. Between 1973 and the summer of 1976, nine textbooks and instructors' guides, one manual, 11 motion pictures, and 21 filmstrips were conceived, developed, and produced.*

> *. . . Few projects in any field of discipline—and certainly none in the field of teacher education—have been so carefully predesigned and systematically produced to specifications, and few have had so much feedback at several stages as the IGE Teacher Education Project in Wisconsin.*
>
> *W. C. Meierhenry, 1976*

I secured authors who wrote nine textbooks and accompanying instructor's guides. The project team worked with a commercial film company to produce films and filmstrips to accompany each text. We designed these materials for use in both preservice and inservice education programs. Seven sets were for use in teacher certification programs; two were for use in graduate programs, one for unit leaders and one for principals. We also formulated the concept of state IGE networks and used $240,000 of the SRF project grant to establish and fund 14, with the support starting in 1973–74 and continuing through 1975–76. The Center established and funded nine (Klausmeier, Walter, & Lins, 1974). The Networks included representatives from the state education agency, teacher education institutions of the state, and IGE schools and school district offices. The goal of the IGE Teacher Education Project was to facilitate the implementation and institutionalization of IGE. The state IGE networks were established to lead this effort in their states, and the IGE materials were produced to aid network personnel in this effort. As an outcome of the implementation efforts of the Wisconsin Center, /I/D/E/A/, and the IGE Teacher Education Project, over 2,000 elementary schools in the 23 network states and in 14 other states had changed to IGE by 1974–75 (Rossmiller, 1976, p. 20). Others started the changeover in 1975–76.

Another step toward institutionalization was taken in 1973 when the IGE coordinators of 12 states, stimulated and supported by the IGE Teacher Education Project and the Wisconsin Center, founded the national Association for Individually Guided Education (Klausmeier, 1977b, p. 6). The Association held its first annual convention in Madison in 1973 and returned to Madison for its seventeenth in 1989.

> *The purpose of the Association for Individually Guided Education, Inc., shall be to provide an appropriate environment for the dissemination, installation, maintenance, refinement and institutionalization of Individually Guided Education (IGE).*
>
> *The objectives of the corporation include:*
>
> 1. *Establishing minimum standards of organization and instruction consistent with the concepts of IGE,*
> 2. *Supporting and encouraging the establishment of state and regional networks, and*
> 3. *Serving as a general forum for communications of research and development in all aspects of IGE.*
>
> *Association for Individually Guided Education, 1973*



At annual conventions of the Association for Individually Guided Education, William Whitsitt (top left) in 1974 and Sarah Hargrave (bottom left) in 1975 of The Sears-Roebuck Foundation and Herbert J. Klausmeier (right) of the IGE Teacher Education Project recognized schools across the U.S. for their excellence in implementing IGE practices, practices highlighted in the films and filmstrips of the Leadership Series in Individually Guided Education.

The Center developed a five-phase IGE implementation strategy that each state education agency was responsible for carrying out with schools of its state: awareness of IGE concepts, practices, and curricular materials; commitment to IGE concepts; changeover to IGE; second-year maintenance and refinement; and institutionalization (Klausmeier, Karges, & Krupa, 1977). An implementation team from the Center initially aided personnel of the state education agency in carrying out the first three phases with the first schools of its state. Thereafter, the state education agency had responsibility for all five phases.

IGE schools adopted the Center's curricular and instructional programs on an optional basis. Other schools that implemented objective-based instruction could use them. Many did, inasmuch as in the 1970s very little instructional material of this kind had been published. Thus, these curricular programs contributed to some restructuring of elementary schooling, even though the schools did not implement other IGE components. As we saw earlier, in 1975–76 more than 4,700 elementary schools in all 50 states were using the completed portions of the *Wisconsin Design for Reading Skill Development*, while approximately 100,000 students in 234 school districts in 38 states, Washington, DC, and five foreign countries were using the DMP materials for grades K-4. The *Pre-Reading Skills Program* was in use in more than 2,000 schools in 43 states, and some 600 persons had been trained as IGM coordinators to provide inservice education to prospective users of *Individually Guided Motivation* (Rossmiller, 1976, pp. 21, 22).

> *Individually Guided Education is a breakthrough in forms of human association for the use of effective procedures and techniques of teaching and learning. It provides a social context for learning, including classroom organization, school-wide planning, and system wide coordination. Its comprehensive network of human associations provides, for the first time, a context for both pre- and inservice teachers to expand skills to cope with them. Futhermore, ample materials are provided for pupils, teachers, group leaders, and administrators who are introducing and operating the program.*
>
> *B. Othaniel Smith, 1977*

Evaluations of IGE Implementation

The large-scale diffusion of IGE by state education agencies started in 1971–72. In that year 275 schools were involved in changing to IGE. An evaluation of the extent of the implementation by the schools showed that nearly all the schools that started the changeover had continued it during the year. Many schools had come close to institutionalizing the organizational-administrative arrangements and the individual instructional programming strategy in at least one curricular area. Though this had occurred, the evaluator indicated that some schools might require three or four years for full implementation and institutionalization of these IGE components; most would not complete it in one year (Ironside, 1973).

The last study of implementation was conducted from 1976 to 1978–79 (Romberg, 1985). It was a large-scale four-phase study. A preliminary task undertaken in the spring of 1976 was to locate the IGE schools; a very large number, 1,426, were located. These were schools that had kept in touch directly with the Center or through their own state IGE network. Roughly 1,000 of these schools responded to a survey and 90% of them indicated that they considered their schools to be IGE schools (Romberg & Stewart, 1985).

The same survey identified the extent to which the Center's curricular programs were being used in the schools. Zajano and Stewart (1976, p. 16) found surprising results. Only 14% of the schools having kindergartens were using the *Pre-Reading Skills Program* and only 11% of all the schools were using *Developing Mathematical Processes*. From 17% to 25% were using one or more of the four motivational procedures of *Individually Guided Motivation*, the tutoring program being the most widely used of the four. Relative to the *Wisconsin Design for Reading Skill Development*, 5% of the schools were using the combined Self-directed, Interpretive, and Creative reading elements; 19% Comprehension; 37% Study Skills; and 52% Word Attack. In summary, PRS, DMP, IGM, and all of the elements of WDRSD except Study Skills and Work Attack were used in 25% or fewer of the participating IGE schools. PRS and DMP were relatively expensive materials and were not commercially available until 1974 to 1976.

Stewart, Klopp, and Buchanan (1978) ascertained the extent to which all seven of the IGE components were being implemented. Full implementation of a component required the school to carry out several practices. The average percentage of implementation of the practices was 56 for the administrative-organizational arrangements, 58 for the instructional programming model (IPM), 63 for curricular materials compatible with the IPM, 55 for the evaluation model, 50 for the program of home-school-community relations, 45 for facilitative environments, and 48 for continuing R & D. Ninety-six percent of the schools had started the changeover between 1970 and 1975. Clearly, many of them had either not made the complete changeover or they had discontinued some of the IGE practices after starting them. Based on my experiences with the state education agency IGE coordinators from 1971 to 1976, I believe that many schools had not yet made the complete changeover by December of 1975, the last month of implementation funding to the states. By 1977–78, the year of the IGE implementation survey, some of the schools that had started implementation before and after 1975 had likely discontinued some of the IGE practices. However, despite the lack of full implementation and discontinuation, Romberg and Stewart (1985, p. 72) indicated that about one-quarter of the schools in 1977–78 who called themselves IGE were, in fact, implementing most of the IGE practices.

In 1977–78 as Phase II of the Romberg research, Ironside and Conaway (1979, pp. 93-107) carried out a critical comprehensive evaluation of IGE implementation. These two objective, external evaluators from Research Triangle Institute visited 30 IGE schools in 16 states. The 30 schools were selected so that half

were very low and half were very high in their implementation of IGE practices. The evaluators made several important discoveries. First, IGE concepts and practices were differentially understood, valued, and implemented by the 30 school staffs. The multiunit organization was best understood and implemented. A second finding was that personnel of the state IGE networks had supported the schools in getting started, but this support had declined. This loss of support was accompanied with a decline by the school personnel in IGE attitudes, in acceptance of the more demanding IGE concepts and practices, in staff development related to IGE, and, most important, in affiliation with any active IGE network. Despite this, some of the 30 schools were implementing nearly all of the IGE practices effectively. Ironside and Conaway (1979, pp. 105, 106) concluded that the schools had implemented all the IGE components but not necessarily in the coherent integrated fashion that was intended. Some IGE schools appeared to have aimed high and had fallen somewhat short, settling into a locally feasible adaptation of IGE that may have been less than the ideal but, most important, the schools were no longer traditional. Other schools had edged slowly up to that same level. In either case, the basic IGE concepts were not necessarily lost or devalued. They were redefined. By 1977–78, schools had decided on the minimal IGE elements that represented their goals, altered the model's goals and components to fit their situations, and had chosen priorities within their resources.

As another phase of the Romberg evaluation, Popkewitz, Tabachnick, and Wehlage (1982) studied six IGE schools that had been reported to be exemplary. They found that these six schools were implementing the IGE practices but in different ways. Three of the schools focused considerable effort on the management of instruction by use of objective-referenced tests and tested their students frequently. Another school gave relatively little attention to testing but developed a curriculum weighted heavily in favor of developing students' creative and analytical thinking. The other two schools were using the IGE terminology, but the staff did not seem to be fully committed to implementing the related IGE practices. Applying more stringent evaluation criteria than Ironside and Conaway, these evaluators concluded that each school was continuing in an educational pattern that had prevailed before it purportedly changed to IGE.

In summary, IGE implementation got off to a good start in Wisconsin in 1968–69 and nationwide in 1971–72 and 1972–73. A severe cutback in federal funding in 1973–74 seriously impeded the implementation, and the cessation of federal funding in December of 1975 brought it to a near standstill. The establishment and funding of state IGE networks by the IGE Teacher Education Project starting in 1972–73 ameliorated the federal funding problem somewhat, but only into 1975–76. The prior evaluations of IGE in 1977–78 indicated that some 25% of the schools that called themselves IGE were then implementing most of the IGE practices (Romberg, 1985) and that all of them were no longer completely traditional schools (Ironside & Conaway, 1979). We cannot tell whether some IGE schools may never have implemented some of the practices in the manner intended or

whether they ceased implementing them after federal funding and state IGE network support ceased. Ironside and Conaway imply that both occurred.

Evaluations of IGE Outcomes

Professors and their teams who developed a component of IGE evaluated it in terms of how it functioned and its effects on the implementing staff and/or the students. Each team throughout the years had funds for this purpose. However, monies were not available for annual evaluations of IGE in its totality as an alternative form of schooling. Instead, from 1967 to 1975 the Center allocated an increasing proportion of its funds to complete the curricular programs and to implement IGE.

In January of 1976 NIE provided funds to the Wisconsin Center to locate and summarize any evaluation-type studies that had been completed on IGE through the years. Forty-six studies were found, thirty-four of which were conducted by researchers not employed by the Wisconsin Center (Katzenmeyer, Ingison, Zajano, & Romaniuk, 1976, pp. 15-22). The studies were of three kinds: comparisons of IGE schools with non-IGE schools, comparisons of the performances of IGE students and staffs across time before and after implementation started, and relating outcomes to particular IGE objectives, such as a desired or an expected student achievement level. Of the 46 studies, 35 reported positive findings and 11 neutral findings. No study showed conventional schools to be performing better than IGE schools.

Seven of nine studies using standardized tests showed student achievement favoring IGE schools, while the other two showed no differences. Most of these studies involved achievement in reading or mathematics. In another study reading achievement was higher in the IGE schools as measured by tests of the *Wisconsin Design for Reading Skill Development*. Student self-concepts and attitudes toward schooling were more positive in IGE schools in two studies and the same in two other comparisons. In another study students who were followed from an IGE school into a junior high school were rated higher than other students by their teachers in decision making, self-responsibility, self-concept, and interpersonal relations.

Several studies focused on the multiunit organization and administrative arrangements. Teachers had greater involvement in decision making in IGE schools at the classroom level and building level, and there was greater job satisfaction. Principals were less aloof and showed more considerateness. Fewer individual decisions and more group decisions were made. Unit leaders as well as principals were persons of influence in the schools. There was more sharing of activities by teachers in IGE schools. Students in IGE schools experienced very different activities than did students in non-IGE schools. Other studies showed that in IGE schools the students used a wider variety of instructional materials and there was a greater variety in the size of learning groups. The intellectual climate was stronger in IGE schools, but there was also more disorder and greater impul-

siveness. Four researchers reported positive reactions to IGE by teachers, students, and parents. A final conclusion of Katzenmeyer et al. (1976, p. 21) was that IGE schools were able to implement the organizational-administrative arrangements and that greater implementation was accompanied by more positive student outcomes. Relative to the IGE instructional strategy, the outcomes were less unequivocal, although higher educational achievement as measured by standardized tests was found consistently.

Returning to the Romberg (1985) evaluation, we find a less positive picture at the time the data were gathered in 1977–78. Briefly, the extent to which schools implemented IGE practices was not related to the mean achievement of students in mathematics and reading as measured by standardized tests. However, teacher job satisfaction was higher in the schools that implemented IGE practices more completely (Romberg, 1985, pp. 99, 100). The mean achievement of students in IGE schools using *Developing Mathematical Processes* and *Wisconsin Design for Reading Skill Development* was not higher than that of non-IGE schools, based on criterion-referenced tests (Romberg, 1985, pp. 172-186). The researchers found that these curricular programs were sometimes not used in the IGE schools in the manner intended by the developers.

In retrospect we see that IGE flourished from 1968–69 into 1972–73, experienced an implementation setback in 1973–74, but appeared to come back through 1974–75. Hundreds of thousands of children benefited from IGE practices annually during these years, as is reflected by the many studies reporting positive student outcomes in the cognitive and affective domains. By 1977–78 the situation had changed. Fewer IGE schools were being started. Some existing IGE schools were discontinuing some of their IGE practices. Some state IGE networks and other external organizations had ceased and others were lessening their support of IGE schools. The change from expansion to that of some schools reverting back to conventional practices had occurred in three short years. The cessation of support to the 23 state IGE networks from the Wisconsin Center in December of 1975 and from the IGE Teacher Education Project in 1976 precipitated the change. The budget crunch and the back-to-the-basics movement mentioned earlier in this chapter took their toll. Despite these negative factors, many IGE schools continued to be healthy strong organizations as Ironside and Conaway (1979) and Romberg (1985) indicated. A number of the state IGE networks continued. And by 1989 most IGE practices had made a very strong comeback. More will be reported regarding this later.

MOVING UPWARD: TOWARD A RESTRUCTURING OF SECONDARY EDUCATION

The forces mentioned in the first of this chapter that impacted on IGE negatively struck secondary education even harder in the mid-1970s. Many national and state commissions expressed their deep concerns for secondary education. The reports from 1973 to 1977 showed that the concerns were with all elements of secondary education, including the curriculum, teaching, learning, evaluation, and advising (Klausmeier, Lipham, & Daresh, 1983). Some of the con-

cerns were with the education of a particular group of students, such as a language or racial minority, while others included the entire secondary school population.

These widespread concerns reflected a fundamental problem in secondary education, namely, local schools had not developed their own improvement capability. The inability to improve their own educative processes prevailed in part because faculty members perceived their roles only as teachers, advisors, or administrators, not as members of a professional team working together to improve education in their school. Other deterrents to the development of a self-improvement capability were obsolete organizational structures and lack of a strategy for identifying problems and resolving them. Moreover, district office and state education agency personnel were not providing needed assistance to the schools. Along with these deterrents, changes in the family, the community, and society at large made demands on secondary schools that were increasingly difficult to meet.

As a response to these conditions, Professor James Lipham and I, assisted by an able team of project associates and graduate students, began cooperative research and development with secondary schools (Klausmeier, Lipham, & Daresh, 1983). We also started a network of innovative secondary schools. Our concern was the conceptualization, utilization, and preliminary validation of a conceptual framework for improving secondary education. I shall refer to this as the Design. In a second project, I completed the refinement and validation of the Design and identified the requirements for institutionalization of the practices based on it (Klausmeier, 1985b). In both projects the primary interest of the participating research schools was to improve student outcomes. The secondary interest was to develop a self-improvement capability. In the first project we conducted improvement-oriented educational research cooperatively with five secondary schools over a period of four years and in the second with 10 schools and their three district offices over a period of two years. We completed in-depth case studies of each school in each project.

Two points merit attention. First, the scope of our work relative to secondary schooling was small compared to that which the Center staff carried out relative to IGE. And second, the present account does not report the work of the National Center on Effective Secondary Schools that started in 1985. Professors Fred Newmann, Director, and Gary Wehlage, Associate Director, provide the flavor of that Center's activities in chapter 3.

A Design for Improving Secondary Education

The secondary Design has ten components (Klausmeier, Lipham, & Daresh, 1983). Five of them focus on educational programming and instructional programming for the individual student, curricular arrangements, career education and experiential learning, student decision-making arrangements, and evaluation. Three are concerned with administrative arrangements, the organization for instruction and advising, and home-school-community relations. The last

Secondary schools from many states participated in validating the Design for the Improvement of Secondary Education, which included teacher participation in educational decisions, teachers serving as educational advisors, a variety of learning activities, career education including work experience, and home-community involvement.

two involve support arrangements and continuing research and development. Each component has a comprehensive objective that indicates a global process and enabling objectives that indicate what a school does to attain the comprehensive objective. Four comprehensive objectives and one set of enabling objectives follow for illustrative purposes.

Illustrative Comprehensive Objectives:

> ***Career education and experiential learning***: Career education is arranged for all students; experiential learning activities and work experience in the community are arranged for each student who can profit from them.
>
> ***Educational programming for the individual student:*** An individual educational program of course work and other activities is arranged for each student each semester that satisfies the student's developmental needs and characteristics and that also meets district and state requirements.
>
> ***Evaluating student learning and educational programs:*** The school staff evaluates the individual student's progress toward attaining his/her course objectives, the student's instructional program in each course, the student's total educational program, and the school's total educational program; the staff uses the evaluation results in improving the educative processes of the school.
>
> ***Organization for instruction and student advising:*** The faculty and students are organized into small instructional units that permit instruction and advising to be personalized.

Illustrative Enabling Objectives Pertaining to Instruction:

> *A teacher* of each instructional unit chairs the meetings of the unit. This teacher, or a different one, represents the unit as a member of the school's Educational Improvement Committee and participates in the Committee's planning and other activities. He/she transmits information from the teachers of the unit to the Educational Improvement Committee and from the Education Improvement Committee to the unit teachers.
>
> Related to instruction, *each group of teachers* of an instructional unit cooperatively develops the procedures for planning, monitoring, and evaluating each student's instructional program in each course taught by the group, and plans and evaluates the group's instructional strategies.
>
> Related to the group's instructional functions, *each teacher* outlines the content of his/her courses and develops the learning guides that students use in the courses. Each teacher plans the instructional methods for the courses, including the use of time,

materials, and modes of instruction. All teachers of the unit participate in all aspects of the group's planning and evaluation activities and carry out their instructional activities in accordance with the group's plans.

Initial Validation

All of the middle schools and high schools that participated in the first research project implemented most of the Design components. They implemented the individual educational programming component and individual instructional programming component as improvement strategies, directed specifically toward attaining desired student outcomes (Klausmeier, Serlin, & Zindler, 1983). A goal-based improvement strategy emerged from that aspect of the evaluation component dealing with evaluating the school's total educational program. This strategy involves reviewing and updating the school's educational philosophy, aims, and educational programs periodically. On an annual basis, a six-step sequence of activities is carried out:

Assess the school's present status both with respect to student performances and with respect to the functioning of the various components of schooling.

Identify already satisfactory student outcomes to be maintained and identify others to be improved.

Develop a plan for each area to be improved.

Implement the planned activities.

Monitor both student progress and the implementation of the activities.

Evaluate the extent to which the desired student performances were achieved and evaluate the effectiveness of the activities in terms of how well they contributed to attaining the desired student performances.

Each school implemented the educational programming strategy, the instructional programming strategy, or both during the first two years of the project but implemented the goal-setting strategy for the first time in the third year (Klausmeier, Serlin, & Zindler, 1983, p. xvii). Employment of the first two strategies did not yield significantly higher student achievement in the second year than the first year. However, the concurrent implementation of the goal-setting strategy and one or both of the other strategies in the third and fourth years raised the level of student achievement markedly from one year to the next. Thus, implementing individual educational programming, individual instructional programming, or both maintained the same level of achievement from year to year, while implementation of the goal-based improvement strategy was necessary for consistently raising it.

Secretary of Education, T. H. Bell, presented Tom Pautsch (upper left), principal of Webster Transitional School, Cedarburg, WI, the Excellence in Education Award for 1982–83, the first year the award was made to secondary schools. Webster attained many desired educational outcomes through teacher participation in educational decision making, cooperative group learning, and other elements of the Design for Improving Secondary Education.

Student attendance became more regular and student attitudes became more positive from year to year when a school employed the goal-based improvement strategy to improve them. Little change occurred in student attitudes and attendance when a school implemented the goal-based strategy to raise student achievement only.

During the four years of the project, the schools made remarkable progress in maintaining student outcomes that were already satisfactory and improving those that were lower than desired. Moreover, the project staff provided very little hands-on assistance to the schools during the last two years of the projects. The schools, in fact, developed a self-improvement capability. The Design proved to be usable and effective; the schools improved student outcomes by employing it.

Refinement and Institutionalization

Five middle schools and five high schools of three Wisconsin school districts participated in a second research project (Klausmeier, 1985b). The objective was to refine the Design and to identify what might be involved in institutionalizing a self-improvement capability in the district office and in all the schools of a district. In this project, unlike the first project, the district office as well as the schools participated. Moreover, the schools and district offices gathered and analyzed all of the data on student outcomes and provided summary tables to the research team. The team, consisting of myself and a research associate, gathered a great deal of information regarding the implementation of all of the components through on-site observations and structured interviews.

All five middle schools implemented the goal-based improvement strategy and the individual educational programming and individual instructional programming strategies. Two of the five high schools did also and the other three were making progress toward effective implementation in the last year of the project. The schools that implemented the goal-based strategy improved student outcomes, such as academic achievement, attendance, and attitudes.

As might be expected, implementation of the other components of the Design facilitates the employment of the three strategies. The most important is the organizational-administrative component: the principal and representative teachers being organized into an effectively functioning leadership-coordinating group, thereby involving teachers in conceptualizing, planning, and coordinating the school's improvement program. Schools that cannot accomplish this are unlikely to be able to implement the goal-based improvement strategy. Teachers and students being organized into instructional units (families, pods) of four to seven teachers and 100 to 150 students facilitates the employment of the three strategies. This kind of organization is readily implementable in grades 7 through 10 since in these grades all or nearly all students take courses in mathematics, English, science, and social studies. Two other facilitative conditions include teachers' classes being scheduled so that those with mutual interests have a common time during the school day for planning, and staff development being carried out on

an ongoing basis, primarily during the regular school day. District officials must support the school, but yet provide it sufficient autonomy to identify its own areas of improvement. Parents participating in and supporting the school's improvement program contribute greatly to its success.

Relative to the institutionalization of a self-improvement capability, the 10 participating principals and district officials without exception indicated that their districts would need school improvement guidelines, first, to get all of the schools of a district to start an improvement program and then to maintain it. Moreover, the school board of the district must endorse the guidelines as educational policy of the district. Subsequently, district committees were established in the three districts. They prepared guidelines that the school boards of the districts endorsed.

Another very important outcome of this project is a validated conceptual framework for developing and institutionalizing a self-improvement capability in the district office and in each school of the district. The Design is an alternative to the knowledge-utilization model of planned change that federal and state education agencies have been supporting for many years. The knowledge-utilization model calls on researchers to produce knowledge, change agents to transmit the knowledge from researchers to practitioners, and practitioners to use the knowledge. The change agent encourages district administrators to adopt an innovation of interest to the change agent even though the school staffs of the district have not determined their own improvement needs. In recent years scholars have been pointing out that this approach to educational change is not bringing about lasting school improvement, despite the many millions of dollars being spent annually on knowledge production and knowledge transmission. Moreover, schools and school districts have become less able to identify and solve their own problems, and thereby less effective in meeting the educational needs of their students. The present project demonstrates beyond any doubt that local school and school district personnel are able to develop a districtwide self-improvement capability. By use of the Design, the schools and district office become producers and consumers of knowledge and also change agents.

Dissemination and Implementation

The first secondary school project involved more than research with the schools. We developed one filmstrip and one "school experiences" audiocassette for each of the nine components of the Design, except continuing R & D, and an implementation guide. These materials were completed in 1979–80. We called the total program—the Design, the materials, and the recommended workshops and other implementation arrangements—the Wisconsin Program for the Renewal and Improvement of Secondary Education (WRISE). The project staff and others conducted workshops for practitioners and teacher educators in Wisconsin and in a few other states. Some 500 Wisconsin secondary school principals participated in the workshops from 1980 to 1984. The majority of participating middle school

principals subsequently led the implementation of part or all of the Design components in their schools. Very few of the high school principals did.

Outcomes of the second project are being disseminated solely through printed materials. The Wisconsin Center distributed to the 50 state education agencies and to the ministries of education of most industrial nations one book reporting the second research project (Klausmeier, 1985b) and another one suggesting how to implement WRISE (Klausmeier, 1985a).

PUTTING IT ALL TOGETHER: A METAPLAN FOR SCHOOL SELF-IMPROVEMENT

IGE and WRISE reflect successive efforts to improve schooling. I incorporated the best practices from these programs into a Metaplan for School Self-Improvement (Klausmeier, 1987). The Metaplan, shown in Figure 2.1, is a process approach to improving the schools of a district, Kg-12. It provides a conceptual framework to guide the improvement activities of all the schools of a district. It does not suggest how or what to teach. School and district office people make these and other important decisions taking into account state requirements and community expectations. I encourage schools to use practices associated with the effective schools movement, provided that the practices under consideration facilitate the implementation of Metaplan processes.

My consultation with small and large school districts indicates that three to five years are needed to institutionalize the organizational-administrative arrangements and the other processes. In general, elementary schools and middle schools with enrollments of 350 to 1000 adapt the processes to their situations and institutionalize them most rapidly. High schools take longer and, the larger the enrollment, the more obstacles that are encountered.

As we saw earlier, the Wisconsin Department of Public Instruction and the Center worked closely together, starting in 1964. The Department led the implementation of IGE in Wisconsin for many years. It has built many of the IGE and Metaplan ideas into both its statewide school improvement program (Gomoll & Burke, 1988) and its educational standards for Wisconsin Schools (Wisconsin Department of Public Instruction, 1989, p. 2).

At the national level, the U.S. General Accounting Office (1989, September) conducted a nationwide survey to ascertain the extent and the characteristics of effective schools programs in the nation's schools and school districts. The survey showed that schools and districts are implementing their programs by use of a four-phase process:

- Acquaint school staffs with research findings.
- Establish teams of teachers and administrators.
- Assess schoolwide and classroom needs.
- Formulate improvement plans.

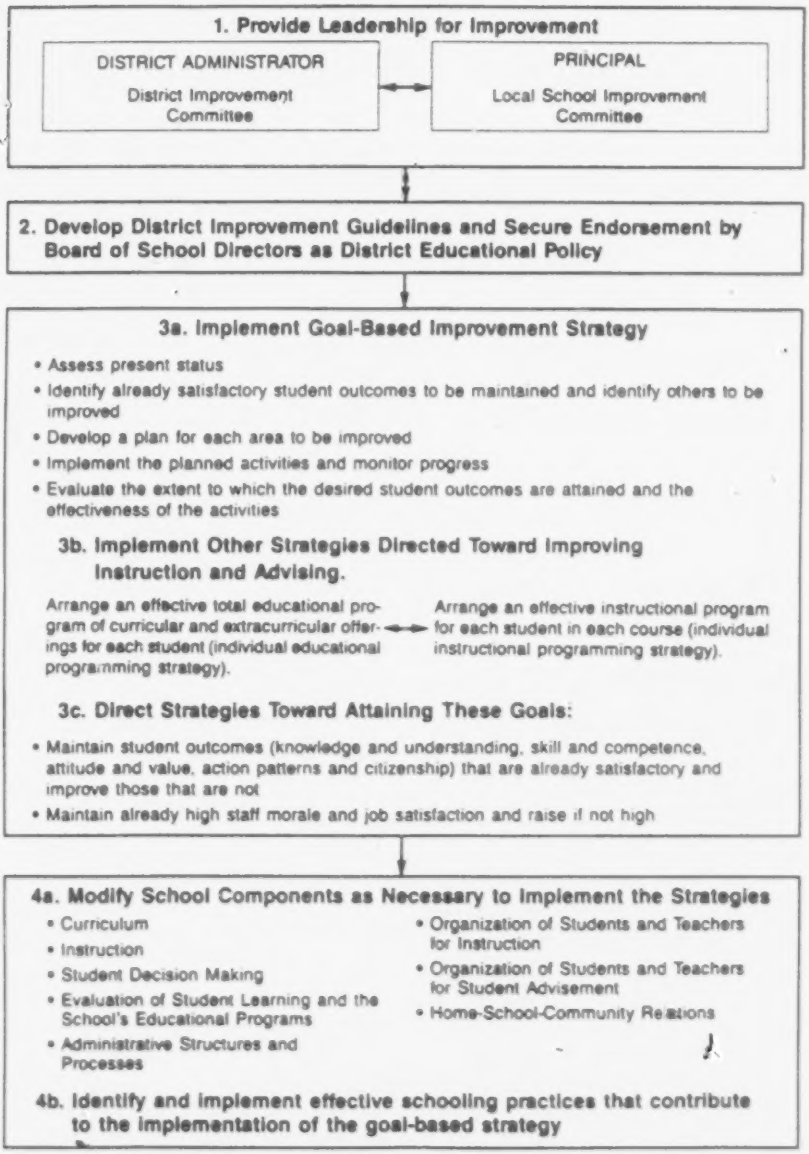

1. Provide Leadership for Improvement
DISTRICT ADMINISTRATOR
District Improvement Committee
PRINCIPAL
Local School Improvement Committee
2. Develop District Improvement Guidelines and Secure Endorsement by Board of School Directors as District Educational Policy
3a. Implement Goal-Based Improvement Strategy
• Assess present status
• Identify already satisfactory student outcomes to be maintained and identify others to be improved
• Develop a plan for each area to be improved
• Implement the planned activities and monitor progress
• Evaluate the extent to which the desired student outcomes are attained and the effectiveness of the activities
3b. Implement Other Strategies Directed Toward Improving Instruction and Advising.
Arrange an effective total educational program of curricular and extracurricular offerings for each student (individual educational programming strategy).
Arrange an effective instructional program for each student in each course (individual instructional programming strategy).
3c. Direct Strategies Toward Attaining These Goals:
• Maintain student outcomes (knowledge and understanding, skill and competence, attitude and value, action patterns and citizenship) that are already satisfactory and improve those that are not
• Maintain already high staff morale and job satisfaction and raise if not high
4a. Modify School Components as Necessary to Implement the Strategies
• Curriculum
• Instruction
• Student Decision Making
• Evaluation of Student Learning and the School's Educational Programs
• Administrative Structures and Processes
• Organization of Students and Teachers for Instruction
• Organization of Students and Teachers for Student Advisement
• Home-School-Community Relations
4b. Identify and implement effective schooling practices that contribute to the implementation of the goal-based strategy

Figure 2.1. Metaplan for establishing a self-improvement capability in each school and in the district office. (From H. J. Klausmeier, 1987, p. 3.)

The Center research that started in 1965 shows how to implement the last three phases successfully and indicates what must be done in the schools and school district offices to insure that desired student outcomes are attained.

RE-EMERGENCE OF IGE PRACTICES

In this chapter I have traced the development and implementation of IGE. We have seen that many schools across the nation implemented IGE practices from 1968–69 into 1975–76. The Wisconsin Center, /I/D/E/A/, and the IGE Teacher Education Project supported the implementation. The large majority of studies completed by Center researchers and non-Center researchers up to 1975–76 showed that implementation of IGE concepts and practices yielded desired student outcomes. The loss of support in 1976, along with the back-to-basics movement and other factors, retarded the changeover to IGE as well as its refinement and institutionalization in some of the existing IGE schools.

Both societal conditions and the educational milieu of the late 1970s had changed by 1985 or thereabouts. Back-to-the-basics and similar movements had lost some of their appeal. Tax revolts were becoming less frequent and state and local support of education was increasing. The effective schools movement that had started in a few large cities in the late 1970s was spreading across the country. Relative to IGE, the National Association for Individually Guided Education that was founded in 1973 continued to hold annual conventions and publish a newsletter. I met with the Board of Directors of the Association in October of 1989 when AIGE held its annual convention in Madison. The Board indicated that IGE practices were coming back into the schools of their states, that many wheels were being reinvented. The Board felt that the AIGE membership would be highly interested in learning how IGE practices were faring across the nation and that this information would be of value to them in their local situations. I agreed to conduct a national survey for this purpose and to make the results available to the Board.

I identified 25 key IGE practices and built them into a survey instrument. From one to five of the practices related to each of the seven components of IGE, except continuing research and development. I might have included more practices; however, I felt that the 25 were sufficient to identify major trends regarding IGE. The term used in the survey form was "elementary school practices," not IGE or any other kind. The instructions invited the respondent to estimate the extent to which the practices "are now being implemented in the elementary schools of your state in comparison with 10 to 15 years ago." The respondent was to indicate whether the practice was being implemented "in many more schools," "in more schools," "in about the same number of schools," "in fewer schools," "in many fewer schools or no schools," or "can't estimate." An official of the state education agency of 42 of the 50 states completed the "Survey of Elementary School Educational Practices." Of the 42 respondents, apparently one misunderstood the in-

The U.S. Department of Education recognized the Conrad Elvehjem Elementary School, McFarland, Wisconsin, Donald Barnes, Principal (upper right), as a School of Excellence in 1985-86, the first year the award was made to elementary schools. This public recognition of Elvehjem Elementary – and of many other IGE schools – contributed greatly to the re-emergence of IGE practices.

structions and three indicated that they did not have sufficient information about the practices to respond; one return came after I had completed the data analysis.

The survey was designed to ascertain the extent to which the various practices had or had not re-emerged from about 1975–80 to 1989. To avoid burdensome details, I shall present the findings regarding two sets of practices – those that were being implemented in more or many more schools of the states and those that were not.

Nineteen of the 25 practices were being implemented in *more* or in *many more* schools of the majority of the states. The 19 practices are organized into three groups corresponding to the following IGE components: (a) curriculum, instructional programming for the individual student, and evaluation; (b) administrative arrangements; and (c) facilitative environments and home-school-community relations. For each of the three groups, the practices are rank ordered from highest to lowest in terms of the percentage of the 37 states in which a practice was being implemented in *more* or *many more* schools; the percentages are also indicated.

Curriculum, instructional programming for the individual student, and evaluation:

92%. The school's objectives in the various subject fields, curriculum areas, are clearly established.

89%. Teachers arrange one-to-one, cooperative small-group, and large-group activities to meet the individual student's needs and to attain the educational objectives.

86%. The educational needs and learning characteristics of each student are assessed.

84%. The curriculum is updated and improved through systematic evaluation.

76%. Curricular objectives, content, instructional procedures, and assessment are carefully aligned.

76%. Student progress in attaining objectives is assessed frequently.

76%. Student progress is monitored systematically to insure student success.

70%. Student attainment of educational objectives is promoted through the use of a variety of high quality multimedia instructional materials (rather than the same basal program for all students).

70%. Teacher observation, student work samples, and similar techniques, not merely paper-and-pencil tests, are used to assess the school's attainment of its goals and its excellence.

65%. The school ascertains how many students have succeeded, rather than getting the average performance of the group, when evaluating an educational program.

57%. Results of standardized educational achievement tests are used to improve instruction, not to categorize, grade, or compare students or schools.

54%. Students are grouped and regrouped for instruction in skill areas, based on their attainment of instructional objectives, rather than being taught identical content as classroom groups.

Administrative arrangements:

81%. The principal serves as an educational leader, rather than as a building manager.

78%. The school has a program or instructional improvement committee that includes teachers and the principal. The committee makes school-wide decisions regarding instruction, curriculum, instructional materials, student evaluation, home-school programs, and in-service education/staff development (teacher empowerment and local initiative).

76%. There is a districtwide program or improvement committee that includes teachers and a district administrator. The committee makes districtwide decisions regarding instruction, curriculum, instructional materials, student evaluation, and inservice/staff development (teacher empowerment, school/district office coupling).

Facilitative environments and home-school-community relations:

86%. The state education agency stimulates the refinement and extension of the preceding practices (all of the practices included in this survey).

84%. The district office provides technical assistance, staff development programs, materials, and other support pinpointed to meet the needs of each school.

65%. Teacher education institutions provide credit courses, noncredit programs, and other services pinpointed to meet the needs of individual schools and/or a districtwide need.

62%. The school's program of home-school-community relations promotes cooperation and communication and resolves conflicts.

In the six practices that follow, I indicate two percentages: the first is the percentage of the states in which the practice was being implemented in about the *same number of schools, more schools,* or *many more schools;* the second is for *more schools* or *many more schools.* The percentages were computed for all 37 states even though from 11 to 16 responses to the last four practices were "can't estimate." This has the effect of treating the "can't estimate" as indicating fewer schools or many fewer schools.

Other practices less well implemented:

84%, 49%. Teachers spend part of each week with other teachers in cooperative planning and similar activities rather than all of their time with students and in individual planning.

81%, 43%. A teacher serves as an educational advisor and school-home contact for certain students.

59%, 30%. The school's teachers and students are organized into instructional units of two to five teachers and 50 to 120 students.

54%, 22%. There is either an instructional aide or a clerical aide for every 4 to 6 teachers.

46%, 11%. Each instructional team has a leader who serves for a specified period of time.

41%, 0%. The team leader is paid for the additional time that he/she works.

The preceding six practices are related to the organization of teachers and students for instruction. All except the last two were being widely implemented in IGE schools from 1971–72 through 1974–75 and to a considerable but lesser extent in 1977–78. Taking this into account and the findings of the survey, we may draw a few conclusions.

More elementary schools across the nation in 1989 than in the late 1970s were implementing the large majority of IGE practices. Practices related to the administrative arrangements at the school and the district levels, instructional programming for the individual student, the curriculum, and facilitative environments were being implemented in more schools or many more schools in the large majority of states. In the majority of, but fewer, states more or many more schools were implementing IGE practices related to evaluation and to home-school-community relations. Four practices related to the organization of teachers and students for instruction were being implemented in the same number of, more, or many more schools in 54% to 84% of the states. Two practices related to the teacher leader of the instructional team were being implemented in the same number, more, or many more of the schools of 41% and 46% of the states.

Related to the larger time frame, this survey points to the need for caution in drawing conclusions about programs designed to improve schooling. Evalua-

tion of the implementation of IGE practices conducted in 1972–73 was highly favorable, less favorable in 1977–78, and again positive in 1989, much as it was in 1972–73. Too, IGE schools from 1969 to 1976 were attaining the student outcomes intended by the IGE developers. It is likely that the schools that in 1989 were implementing many of the practices were also attaining the intended IGE outcomes.

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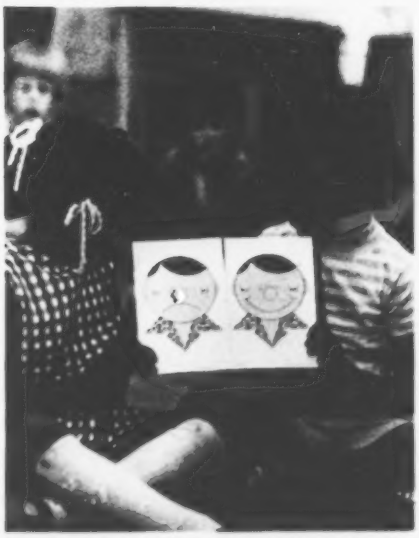

The full educational development of every child, a continuing theme of Center research.

3 Knowledge-Generating Educational Research

This chapter focuses on knowledge-generating educational research. What is implied by the terms "educational," "research," and "knowledge-generating"? Let us consider "educational" first.

The most recent edition of the Encyclopedia of Educational Research *(1982) summarizes educational research related to 256 specific topics. The 256 summaries are presented under 18 comprehensive topical entries. The exceedingly wide boundaries of "educational" are reflected in topical entries such as these: development of human characteristics, education as national and international development, and influences of educational policy. Even the three areas in which the bulk of educational research is conducted are extensive: curriculum, instructional systems and techniques, and teachers and teaching. These comprehensive topics suggest that educational research is conducted by persons in many different kinds of organizations; it is not the domain of only one department, school, or college of a university. Rather, professors in many different departments, colleges, and schools conduct educational research.*

What is meant by "research"? It is essentially scientific inquiry undertaken to establish facts or principles in a field of knowledge, in this case, education. The Encyclopedia of Educational Research *identifies twelve methods of inquiry. Included are the methods that educational researchers used quite widely in the 1960s and thereafter: curriculum, experimental, historiography, measurement, prediction, statistical, survey, and systematic observation. Less widely used or more recent methods are ethnography, evaluation of programs, qualitative curriculum evaluation, and research integration.*

Another way of looking at research methodology is in terms of its purpose. One kind is to gain greater understanding of a phenomenon, such as learning, instruction, or administration. I shall refer to this as knowledge-generating research. Another kind of research is tied closely to the development of educational products, such as a curricular program. This research is conducted to understand more fully how the target children learn the particular content, the difficulties they may encounter, and means of overcoming the difficulties. This research generates knowledge that is directly related to the particular curricular program. However, the knowledge may generalize to other curricular programs. I

formulated a third methodology and called it improvement-oriented educational research. It is more a paradigm than a method. It is directed toward improving any facet of schooling that practitioners may wish to address. This kind of research generates knowledge that is used by the practitioners who participate in the research; however, the findings may generalize to situations similar to those in which the research is conducted.

Across the years from 1964 through 1989, 141 professors from many departments of six different UW schools and colleges conducted educational research supported by the Wisconsin Center. These professors are the primary history makers of the Center.

In this chapter eleven of them provide brief accounts of their knowledge-generating research. Had space permitted, I would have invited all of the professors who conducted this kind of research. I selected the 11 to be representative of the 25-year time period, the Center's research programs, and length of time of Center appointments. My invitation to them was open with respect to what they would report regarding their Center research. I did, however, suggest a limitation on the length of their narratives and the number of publications to be listed.

Herbert J. Klausmeier

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Herbert J. Klausmeier received the Ed.D. from Stanford University in 1949. He served as Assistant and Associate Professor of Psychology and Education at the University of Northern Colorado, 1949–52; and as Assistant, Associate, Professor, and V. A. C. Henmon Professor of Educational Psychology, University of Wisconsin, 1952–86. He held summer or semester appointments at the University of California, Berkeley, and at the University of Hawaii. He was the Co-Director for Research and then Director of the Wisconsin Center for Education Research, 1964–72.

Professor Klausmeier was President of the Rocky Mountain Branch of the American Psychological Association, 1951–52, and President of the Division of Educational Psychology of the American Psychological Association, 1970–71. He received the Alumni Distinguished Service Award from Indiana State University in 1962; the Award for Educational Leadership from the Association for Individually Guided Education in 1976; the Distinguished Friend of Education Award from the Association of Wisconsin School Administrators in 1982; the Award for Service from the Division of Educational Psychology of APA in 1985; and the Phi Delta Kappa Biennial Award for Outstanding

Contributions to Education Through Research in 1985. He is listed in Who's Who in America *and* Who's Who in the World.

Professor Klausmeier has been recognized by his colleagues as the founder of the Wisconsin Center for Education Research and the father of Individually Guided Education. His other creative accomplishments include a theory of concept learning and development and a related instructional design, a program of individually guided motivation, a metaplan for school self-improvement, and an improvement-oriented educational research paradigm. Income from the royalties that accumulated from the sale of the materials of the IGE Teacher Education Project that he directed and that was funded by The Sears-Roebuck Foundation is being used at his request to support the SRF-Bascom professorship in the UW School of Education. His Learning and Human Abilities: Educational Psychology, *used extensively in its English edition and German, Portuguese, Spanish, and Urdu translations, introduced many practitioners to the research findings and instructional practices emanating from the Wisconsin Center.*

We may recall from chapter 1 that the Center's mission from 1964 to 1969 was to improve schooling through research and development, primarily in the cognitive domain. Much of the Center's research during this period focused on concept learning and teaching. Here I shall report my programmatic R & D related to concept learning and teaching but will not attempt to relate my work to that of the other Center project directors. I had research support and able graduate students and others as members of successive research teams to pursue this line of research. We carried out large-scale cross-sectional and longitudinal studies of children's cognitive development and also many experiments on teaching concepts in classrooms and other settings. Our typical research team was an assistant scientist, three to five graduate students, and myself. Dorothy Frayer and Elizabeth Ghatala were key members of one team as graduate student research assistants and as assistant scientists after being awarded the Ph.D.

My early interest in concept learning and teaching stemmed from *A Study of Thinking* by Bruner, Goodnow, and Austin (New York: John Wiley, 1956). The research of my team led to a serious questioning of Piagetian theory. We found that Piaget's four stages of cognitive development—sensorimotor, preoperational, concrete, and formal—were inadequate descriptions of concept development and that mental processes were more useful than Piagetian mental structures in explaining cognitive development. We affirmed Bruner's propositions that both language and instruction had more powerful roles in cognitive development than implied by orthodox Piagetian theory. Across some 25 years, aided by the members of the successive research teams, I formulated and refined an alternative to Piagetian theory and developed a related design for teaching concepts.

Our first research team was interested in clarifying the nature of concepts, the mental processes involved in concept learning, and the instructional variables that facilitate concept learning. We were aided in this through a national conference that Chester Harris and I organized. At this conference scholars presented

invited papers on the nature of concepts, concept learning and development, learning-teaching processes, and the concepts of various subject fields (Klausmeier & Harris, 1966).

We started with the assumptions that concepts are the fundamental tools of thought and that they vary in power, generalizability, abstractness, and other attributes. Our early cross-sectional research and classroom experiments confirmed a number of theoretical propositions regarding concept learning and development (Klausmeier, 1971; Klausmeier, Ghatala, & Frayer, 1974). Concepts are learned in an invariant sequence at successively higher levels of understanding. The four levels at which any given concept is learned are the concrete, identity, classificatory, and formal. As a concept is learned at each successively higher level, it is used increasingly well in understanding principles and in solving problems. The mental processes employed in learning any given concept, such as *tree, observing, rough, between,* and *space,* emerge with neural maturation and experience, instruction being the most important kind of experience.

The mental processes that are necessary and sufficient for attaining a concept at the concrete level, for example, an infant attaining a concept of a particular toy, are attending to the toy, discriminating it from its surroundings, representing it internally in the form of a visual image, and later retrieving the image and recognizing the toy as the same one seen earlier. Generalizing that the toy, when later seen from a different orientation, is the same toy is the process involved in the infant's attainment of the concept of this specific toy at the identity level. Generalizing that this toy and another one like it are equivalent is the process that enables the child to attain the classificatory level of *toy*. The processes of attending, discriminating, internally representing, retrieval, and recognition are also involved in attaining the identity and classificatory levels. Language is not required to attain these three levels of a concept; however, it facilitates the attainment. Language processes are prerequisite for attaining the formal level of a concept. The language processes include learning the names of the concept and the concept's properties, or attributes, and acquiring a definition of the words that name the concept. Other processes involving language include either hypothesizing and inferring the concept inductively or assimilating and processing information about the concept that is provided to the learner. Across the developmental years, the mental processes and the language processes become operational in the order given and are carried out with greater economy, on more material, and with increasingly abstract material.

We validated the preceding propositions of the theory in a four-year longitudinal study (Klausmeier & Allen, 1978). In this study we annually assessed the participating students' level of development of concepts, their understanding of principles in which the concepts were embedded, and their ability to use the concepts and principles in solving problems. The study had four cohort groups, each consisting of 50 boys and 50 girls who were beginning grades 1, 4, 7, or 10 and who remained to complete grades 3, 6, 9, or 12. In this same study we charted the

normative course of conceptual development during the school years. We may refer to each of the preceding mental processes and the facilitative language processes as a cognitive item. From age 6 to age 9 these items, for example generalizing that two things are equivalent, develop at a more rapid rate than during later years. The rate of gain of the various items differs from one year to the next, and each item has its own gradient. To illustrate, the growth gradient for discriminating between right triangles and equilateral triangles is different from that for acquiring the names of the attributes of *triangle*. From 9 to 12 the rate of gain decelerates, but the rate is about the same for all items from year to year and some items reach full functional maturity, for example, generalizing that an equilateral triangle and a right triangle are both triangles. During years 12 to 18 the rate of gain continues to decelerate and full functioning of the remaining items is achieved by some students. These are normative, or average, developmental trends. They do not reflect individual differences.

A difference in the rate at which *the same individual* (intraindividual variability) attains the concepts of each of the four subject fields—mathematics, science, language arts, and social studies—begins at about age 9. This intraindividual variability becomes greater as the individual attains and organizes more concepts of the various subject fields into conceptual cores. We may think of a conceptual core as the individual's mental representation of his/her structure of knowledge of a subject field. From age 12 onward these structures remain differentiated. Accordingly, from age 12 onward a student typically does not attain the concepts of the different subject fields at the same rate. Instead, the rate of attainment varies from one subject field to another.

Differences among students of the same age (interindividual differences) in the level of cognitive development are already large at age nine. At age 18 some students perform no better than others as age 9. We may assume that these 18-year-olds will remain at an elementary-school level of cognitive functioning thereafter.

The consistent intraindividual variability and the huge interindividual differences that we found raise serious questions about Piaget's four stages of cognitive development (Klausmeier & Associates, 1979; Klausmeier & Sipple, 1982). Assuredly, teachers would be unwise to attempt to base concept instruction on the Piagetian stages.

The normative trends that we identified are descriptive of conceptual development under current instructional practices that emphasize the learning of factual information more than concept learning. The question may arise as to whether focused instruction that takes into account the preceding knowledge about concept learning and development might accelerate children's cognitive growth. The answer, based on our many learning experiments, is unequivocal and positive. To illustrate, after 20 minutes of individually guided instruction three-year-old children performed as well as five-year-old control children. After three short lessons, the large majority of third and fourth graders attained and main-

tained the formal level of concepts; their controls remained at the classificatory level. Based on experiments with results such as these, I formulated a design for teaching concepts (Klausmeier, 1976). In a two-year longitudinal study conducted to refine and validate it, children of two experimental schools consistently outperformed those of two control schools (Klausmeier & Sipple, 1980). Weill and Murphy in the 1982 *Encyclopedia of Educational Research* indicate that the concept-attainment strategy is one of the six teaching strategies most well researched and/or widely used.

The instructional design provides principles for teaching concepts at each of the four levels of concept attainment and at combined levels. The teacher chooses the level or combination of levels taking into account both the nature of the concept and the characteristics of the learners. Thus, a fourth-grade teacher, using appropriate examples, non-examples, and verbal instruction, teaches students the identity and classificatory levels of *herb* and *tree*; the biology instructor, using a microscope and verbal means, teaches ninth-graders the concrete, identity, and classificatory levels of *tubercle bacillus*.

The illustrated lessons that we developed and that children used in our experiments produced excellent results. The students learned the target concepts and used them increasingly well in understanding principles and in solving problems. Moreover, they developed basic conceptualizing skills that enabled them to attain concepts more economically and with increasing independence. Unfortunately, I did not have time or monetary support to develop a commercial instructional program, even in one subject field. However, I was invited to update the theory and the instructional design (Klausmeier, 1990). Hopefully, curriculum developers and others will continue to find it helpful in promoting concept learning and other thinking processes in the schools.

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Julian C. Stanley, Jr.

Study of Mathematically Precocious Youth

Johns Hopkins University

I arrived in Madison from George Peabody College for Teachers in June of 1953 as a tenured Associate Professor of Education. Herb Klausmeier had come the preceding year. We worked rather closely together from then on, teaching educational psychology and child development courses to undergraduates preparing to be teachers in elementary or secondary schools (they were usually grouped separately). Also, we "produced" doctoral recipients who went all over the country to pioneer in various aspects of educational psychology. Among the early ones were John Feldhusen, long (and still) a distinguished professor at Purdue University; the inimitable Dick Ripple of Cornell; great statistics teacher Dick Lindeman of Teachers College, Columbia University; famed reading researcher Carl Bereiter of the Ontario Institute for Studies in Education (OISE), a member of the National Academy of Education; and many others of similar luster.

While the Wisconsin Center for Education Research was "incubating" during the period 1954–64, Herb and I, along with other colleagues, were busily at work trying to restructure the field of educational psychology locally and nationally. In 1961, aided by a National Defense Educational Act grant from the U.S. Office of Education, I started the Laboratory of Experimental Design (LED) to prepare a new breed of research methodologists. They were to know statistics and measurement extremely well and be expert consultants. All had to pass an eight-hour written examination in their major field (statistics or measurement) and four-hour written exams in two fields (statistics or measurement, and usually human learning). Also, they were required to prepare a master's degree thesis and defend it orally before a committee of at least three faculty members—besides the doctoral dissertation, of course. These rigorous requirements necessitated recruiting extremely able graduate students. Among the first were Les McLean and Ron Ragsdale, now professors at OISE; Dave Wiley, now Dean of the School of Education of Northwestern University after years on the faculty of UCLA and the University of Chicago; Gene Glass, now a professor at Arizona State University

and the father, or at least the rejuvenator, of meta-analysis; and Andy Porter, the current Director of the Center.

Frank B. Baker came on board in 1961, to be the Assistant Director of LED and to pioneer computer applications. When I moved to Johns Hopkins in 1967, he took over LED and has guided it well ever since.

Those were busy, pleasant days. We educational psychologists operated within a Department of Education that had more than eighty full-time and joint-appointment faculty members. By 1962 that proved too restraining for the dozen educational psychologists, so with Dean of the School of Education Lindley J. Stiles's blessing we created our own graduate Department of Educational Psychology, with me as the first chairman for a limited period. With the stimulation of innovation, the department quickly flourished locally and nationally. It does to the present day.

I was on leave from June of 1955 until August of 1956 as a postdoctoral fellow in mathematics and statistics at the Universities of Michigan and Chicago; from September of 1958 until August of 1959 as a Fulbright Act Research Scholar at the Catholic University of Louvain, Belgium; and from August of 1965 through August of 1967 as a Fellow of the Center for Advanced Study in the Behavioral Sciences on the Stanford University campus. Also, I taught at the University of Hawaii for seven weeks during the summer of 1960 and at Harvard University during the summer of 1963. Aside from those training interludes, I worked day and often at night on a variety of research, development, and service projects, mostly involving various aspects of research methodology: the design of experiments, statistical analysis, test theory, and educational and psychological testing.

It was during this period that the concept of a center arose. I supported the idea from about 1954 onward and served more actively when the Center actually began in 1964. Unfortunately, not being at the University after August of 1965, I did not get to enjoy its unfolding personally beyond that date. I was there in spirit, however, because LED helped provide the rationale for the Center's early training program and later post-doc program. Under Frank Baker's able leadership, LED was, and continues to be, a great technical resource to Center researchers. I believe Herb will agree with me that the quality of the Center research has been improved markedly by this long-term technical support.

Born on July 9, 1918, I began professional life as a very young teacher of science and mathematics in Atlanta, Georgia, high schools, 1937–42. World War II caught me up in the Chemical Warfare Service, attached to the Army Air Corps, until September of 1945. Then, financed by the "G.I. Bill," I studied for four years at the Harvard Graduate School of Education, concentrating on measurement, statistics, and experimental psychology. My thesis for the doctorate was entitled "The differential effects of partial and continuous reinforcement upon the acquisition and elimination of a running response in a two-choice situation"—rats in a T-

maze. When I went to George Peabody College for Teachers in 1949 as an untenured Associate Professor of educational psychology in the Department of Psychology, there were no rat-lab facilities available; so I returned to my great love, statistics and testing.

Four busy years at Peabody led me to the fourteen years on the University of Wisconsin faculty as a research methodologist. I became deeply involved with the analysis of variance, which was quite new to most educational and psychological researchers in those days. We of LED were proud that we understood both experimental statistics and regression analyses. We knew how to manipulate variables as well as how to study "nature's experiments."

My earliest major article (co-authored with William O. Jenkins, my dissertation mentor at Harvard), "Partial reinforcement: A review and critique," occupied 42 pages in the *Psychological Bulletin* in 1950, was widely cited, and seemed to do much to stimulate research on that emerging topic. A briefer experimental article, "Insight into one's own values," in the 1951 *Journal of Educational Psychology* aroused some interest. What I considered then to be my statistical *magnum opus*, "Statistical analysis of scores from counter-balanced tests," got little notice, perhaps because it appeared in the *Journal of Experimental Education*, which my colleague Arvil Barr edited. Probably it belonged in the *Psychological Bulletin* or *Psychometrika*. In those times many of us did not think in terms of citation indexes and the like when choosing a journal to which to submit a paper. Perhaps we'd be wiser nowadays.

Several years later, my "Analysis of unreplicated three-way classifications, with applications to rater bias and trait independence" in the 1961 *Psychometrika* did catch on. It is still cited.

One of my best collaborative efforts, with audio-visual expert Walt Wittich, science educator Milt Pella, and extension-service specialist Chuck Wedemeyer, "The use of the White films in the teaching of physics," appeared in *Science Education* in 1962. Little was heard from it, despite the probable importance of the study. It's difficult to get the word around about the actual impact of such innovations.

Far and away the most used and cited work with which I have ever been involved was my collaboration with psychologist Don Campbell of Northwestern University on a chapter for Nate Gage's *Handbook of research on teaching*, which appeared in 1963. This was "Experimental and quasi-experimental designs for research on teaching." With the last two words deleted, Rand McNally published it as a separate, brief volume in 1966. It went on to be used as a regular or supplemental text in many courses. At least a third of a million students have ploughed through this slender book or employed it as a guide and checklist in their work.

Gene Glass and I co-authored *Statistical methods in psychology and education* in 1970. It seemed to meet real needs in the types of courses he and I had taught at Wisconsin and elsewhere.

Over the years there have been many more, a total of 13 books authored, co-authored, or edited by me and perhaps an indecently large and heterogeneous set of about 450 published articles, reviews, chapters in books, technical notes, and technical letters. Often, I used the sawed-off-shotgun approach rather than the long-range-rifle one. Much of my work has been expository, hortatory, or even anecdotal. In this I often viewed myself more as an instructor and promulgator than a research scientist.

Perhaps several approaches were combined best in my "Reliability" chapter for Bob Thorndike's 1971 revision of the *Educational Measurement* handbook, 87 pages of exposition, derivation, and proof. This *tour de force* of elementary statistical algebra applied to test theory proved to be the swan song with respect to my career as a research methodologist, 1949–71. Thereafter, I have concentrated nearly all my professional work toward finding young persons who reason exceptionally well mathematically and then helping them locate the special, accelerative educational opportunities they need in order to move ahead faster and better in mathematics and related subjects such as physics, computer science, and electrical engineering than would be feasible without such assistance.

This effort has proved remarkably successful (e.g., see Benbow & Stanley, 1983, and Stanley & Benbow, 1986). It has spread across the country via programs at many universities: Duke, Northwestern, Denver, Iowa State, Arizona State, Sacramento State, the University of Washington, the University of Wisconsin at Eau Claire, the University of North Texas, the State of Illinois, etc. Even at Johns Hopkins, the annual identification and summer programming is conducted by another group, the Center for the Advancement of Academically Talented Youth (CTY). In January of 1989, some 33,000 male and female seventh- and eighth-graders took the College Board Scholastic Aptitude Test (SAT) under CTY's auspices. There were about 3300 three-week enrollments in its 1989 summer program. Across the country, more than 100,000 seventh- and eighth-graders take the SAT each year, vs. a mere handful in 1971.

My group, the Study of Mathematically Precocious Youth at Johns Hopkins University (SMPY at JHU), continues, but since 1980 has worked predominantly with those students who have scored at least 700 in SAT-Mathematical before age 13. These represent the top 1 in 10,000 of their agemates in the United States in mathematical reasoning ability. Their achievements are often stupendous: top student in the huge graduating class of the University of California at Berkeley at age 19, gold medal in the International Mathematical Olympiad at age 12, one of the ten top young mathematicians in the world, and so on.

There are now four SMPYs: at Johns Hopkins, Iowa State University, the University of North Texas, and Tianjin, People's Republic of China, where there are 225 members of SMPY's "700-800 on SAT-M Before Age 13 Group." I am planning to phase out my own SMPY activities at Johns Hopkins by 1 July 1992, but

leave the essence of the program in capable hands on the Johns Hopkins campus. The models we have developed are robust. The programs they generate seem to thrive almost anywhere that a zealous enough innovator can be found.

I salute Herb, Frank, Andy, Tom Romberg, and all the others who have seen the Wisconsin Center for Education Research effectively through its first 25 years. May its fame, and theirs, increase during the next 25!

Selected Publications

Benbow, C. P., & Stanley, J. C. (Eds.). (1983). *Academic precocity: Aspects of its development*. Baltimore: Johns Hopkins University Press.

Campbell, D. T., & Stanley, J. C. (1966). *Experimental and quasi-experimental designs for research*. Originally appeared in N. L. Gage (Ed.), *Handbook of research on teaching* (pp. 171-246). Chicago: Rand McNally.

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Stanley, J. C. (1955). Statistical analysis of scores from counter-balanced tests. *Journal of Experimental Education*, 23(3), 187-207.

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Frank Farley

Professor, Department of Educational Psychology

University of Wisconsin-Madison

Professor Farley received his Ph.D. from the University of London, England, in 1966. He became an Assistant Professor at the University of Wisconsin-Madison in 1966, later an Associate Professor, and is currently a Professor of Educational Psychology at the University of Wisconsin-Madison. In 1973 Professor Farley was the founding editor of The Educational Psychologist *with which he was affiliated until 1978. He also served as President of the Division of Educational Psychology of the American Psychological Association in 1977–78 and as President of the American Educational Research Association in 1980–81. From 1983–86 he was Chair of Science and Public Policy Seminars, Washington, DC. Professor Farley served as a member of the Board of Directors of the American Psychological Association, 1987 to 1989. In 1989 he received the E. L.*

Thorndike Award for Distinguished Contribution of Psychology to Education from the Division of Educational Psychology of the American Psychological Association.

Professor Farley probably has the most widely recognized face in American psychology. He has been interviewed regarding risk-taking behavior on most of the major TV programs. In 1990, he was one of five candidates for President of the American Psychological Association.

I joined the Center in the fall of 1966 and continued through the spring of 1971. Early in 1966 UW Professors Chester Harris, Henry Kaiser, and Philip Lambert talked with me in London about my doctoral research that I was completing at the University of London. I wasn't aware that they were looking me over for a position. However, soon after the interview I received a letter from Herb Klausmeier inviting me to join the Center as a research scientist. Shortly after joining the Center I was hired by the Department of Educational Psychology as an assistant professor.

My research at the Center focused on individual differences and memory. I investigated individual differences in short- vs. long-term memory for simple as well as complex tasks, for example, text comprehension. I took a biological orientation to learning and individual differences (intrinsic individual differences). This flowed from my educational background at the University of London and University of Saskatchewan in Canada but represented a departure from most approaches to education at that time.

This line of research led to some interesting findings concerning the arousal value of material (interest?) to memory processes. It also showed that ongoing fluctuations in physiological arousal might be related to effective long-term retention. One of the most educationally relevant aspects of the work was the attempt to pursue adaptive educational models, or ATI, using biological individual differences as the basis for adapting instruction. One important idea here was that such biologically oriented individual differences might be less susceptible to cultural variations and assessment biases and would perhaps provide a more generalizable source of individual variation as a basis for educational adaptation.

Extending this individual differences work from simple forms of learning (e.g., list learning, motor learning) all the way to such complex forms of learning and cognition as text processing and prose comprehension allowed for a rich analysis of the educational relevance of biologically related diversity.

I was able to answer some research questions fully, others only partially, and some perplex me to this day. Some very specific studies answered some very specific questions. However, the overarching questions, the background for much of my work, such as whether and how the brain and the mind "interact" or are related, remain very open. How can one connect biological and neural processes to simple and complex forms of human cognition? What is the identifiable role of brain processes in human learning and memory? Are there biologically referenced

individual differences that are powerful factors in cognition, and what is their relevance to education? Is a "brain-based education" possible or desirable?

Niels Bohr, the great physicist, often prefaced his lectures by saying, in effect, "Treat everything I say as a question, not an affirmation." That idea captures much of my own thinking about such a grand issue as brain and cognition, body and mind. Clearly, no full understanding of education and learning, let alone an understanding of human nature itself, can take place outside of a psychobiological framework.

The work that I pursued at the Center helped in part, I believe, to suggest new approaches to understanding education and learning from a biologically related analysis of human diversity. It contributed to outlining a context in which research connecting these two grand avenues to knowledge—psychology and biology—might come together in advancing education.

I continue to pursue some of the same lines of research. The general framework for my research, that of a psychobiological approach, continues to this day. One interest is the articulation of methods for relating biologically oriented concepts of individual differences to learning, cognition, and education. Another is the elaboration of the powerful concepts of stimulation and arousal into areas of educational relevance.

Selected Publications

Farley, F. (1986). The big T in personality. *Psychology Today,* May, 45-52.

Farley, F. H., & Gordon, N. J. (Eds.). (1981). *Psychology and education: The state of the union.* Berkeley, CA: McCutchan.

Farley, F. H., & Neperud, R. W. (Eds.). (1988). *The foundations of aesthetics, the arts, and art education.* New York: Praeger.

Koester, L. S., & Farley, F. H. (1979). Preference for complexity in the auditory and visual modes. *Journal of Auditory Research, 83-90.*

Strelau, J., Farley, F. H., & Gale, A. (Eds.). (1985). *The biological bases of personality and behavior I: Theories, measurement techniques, and development.* New York: McGraw-Hill/Hemisphere.

Strelau, J., Farley, F. H., & Gale, A. (Eds.). (1986). *The biological bases of personality and behavior II: Psychophysiology, performance, and application.* New York: McGraw-Hill/Hemisphere.

Joel Levin

Professor, Department of Educational Psychology

University of Wisconsin-Madison

Joel R. Levin has established an international reputation for his research on children's learning-and-memory strategies. His prolific publication record of 225 journal articles, synthesis chapters, and monographs in two decades (with more than 125 resulting from Center-related work), was foreshadowed by his rapid rise as a new University of California-Berkeley Ph.D. in 1969 to a University of Wisconsin Full Professor just four years later. In addition, his distinguished research career received recognition through a UW Romnes Faculty Research Award in 1980. He is past Associate Editor and present Editor of the Journal of Educational Psychology, *the leading journal of educational research reviews. He is a fellow of the American Psychological Association (APA) and a past Vice President of the 10,000-member Learning and Instruction Division of the American Educational Research Association (AERA). Twice he has won AERA's Palmer Johnson Award for the outstanding journal article of the year. An exemplary and accomplished teacher as well, he received a UW Kiekhofer Teaching Award in 1971 and has trained a large number of Ph.D. students who have gone on to make major research contributions of their own.*

Putting together this chapter has been much more than a historical account of my Center research on learning and memory. Rather, I have learned that it has been a trip down memory lane as well. And what a glorious "trip" it has been! So, a special "Thanks for the Memories!" to our first and foremost Center Director, HJK, for making it all possible—including this "steeped-in-Wisconsin-tradition-and-scholarship" volume.

As a still wet-behind-the-ears Assistant Professor of Educational Psychology, I became affiliated with the then "Wisconsin Research and Development Center for Cognitive Learning" in 1970. My reasons for doing so were decidedly not "many and varied," but few—in fact, two: First, the R & D Center provided me with a fairly stable source of funding for what I believed would be (and what, in fact, turned out to be) a long-term, programmatic research effort on children's learning processes and strategies. Second, the Center enabled me to address, and frequently redress, my educational-research agenda in the company of, and in collaboration with, a cadre of extremely talented UW faculty colleagues: notably, colleagues such as Robert Davidson, Peter Wolff, Gisela Vief, and Steven Yussen.

In my 15+ years as a Center Principal Investigator (PI), and with the more than $1 million of research funds for which I was personally responsible, I was

able to provide support for 19 graduate students, 3 postdoctoral fellows, and a research scientist. The research scientist was Elizabeth Schwenn Ghatala, now at the University of Houston; and one of the postdoctoral fellows was Michael Pressley, now at the University of Maryland. The long-term research relationships that I have enjoyed with these two gifted scholars—resulting in some 75 co-authored publications—I regard as the Center's most valuable contribution to my own professional development.

So much to do, so little time. But we did, and on time. My early (1970–74) Center research on verbal and pictorial learning-and-memory strategies, and associated cognitive-developmental issues, was a direct outgrowth of the work initiated by my UC-Berkeley advisor, William Rohwer, Jr. I will never forget those antecedent research roots, nor my subsequent research routes:

> Sparked by the careful analytic work of Center Advisory Board member and professional colleague Benton Underwood on memory attributes, in 1973 Elizabeth Ghatala and I began to investigate a variety of developmental, modality, and educational questions associated with Underwood's "frequency theory" of discrimination learning, including the theory's implications for designing valid multiple-choice tests.
>
> In collaboration with Alan Lesgold at Pittsburgh's Learning Research and Development Center, in 1975 I initiated a series of experiments on the differential influences of pictorial illustrations on students' learning from text, experiments that led to a "functional" classification of text illustrations.
>
> With Michael Pressley, in 1978 I embarked on a comprehensive program of research to assess the educational potential of "mnemonic" techniques (systematic procedures for improving memory). From Pressley's doctoral study of mnemonic foreign-vocabulary learning to our more recent studies of mnemonic taxonomies ("mnemonomies") for acquiring science concepts and relationships, several sound psychological principles of learning and memory were applied to the development of effective materials and strategies.
>
> A three-way collaboration with Elizabeth Ghatala and Michael Pressley, which began in 1982, the latter period of my Center involvement, produced a number of insights into the essential "metacognitive," student-controlled, processes that underlie the independent deployment of beneficial learning strategies. A number of specific educationally relevant prescriptions sprang directly from that research.

Today, the tangible remains of my previous life at the Center consist of a paper trail—or should I say a paper "stack"?—on a bookshelf somewhere in the corner of some office in our present-day Johnson Street location. Virtually all (with three or four exceptions) of those Center technical reports, theoretical papers, and working papers found their way to the light of publication, which

amounted to a book detailing the research of Center faculty (co-edited with the late Vernon Allen), 9 book chapters, and 120+ refereed journal articles. More than 25 master's theses and doctoral dissertations were also produced with the support of Center funds.

Throughout my research career, I have generally striven to provide specific *prescriptions for improving teaching and learning,* in the form of research-based instructional materials and strategies, as opposed to the more usual static *descriptions of teaching and learning activities.* Examples of such prescriptions for instructional improvement include:

> materials that help students remember the U.S. states and capitals and the presidents, which (a) were systematically developed on the basis of theoretical principles of learning and memory and (b) were empirically validated on the basis of controlled empirical research. These materials are now used in classrooms throughout the country.
>
> articles published in magazines for teachers and educational practitioners, informing them of effective instructional adjuncts (e.g., illustrations in text) and instructional strategies (e.g., memory-enhancing vocabulary techniques).
>
> specific instructional strategies and materials developed for students with learning difficulties and those with inefficient study skills, which encompass both school-aged disabled learners and postsecondary "at-risk" minority students. For instance, UW minority freshmen have benefited markedly from specially designed vocabulary materials in their introductory foreign-language courses.
>
> citations of my Center-related research that have been included in both memory-strategy and study-skills books targeted for the general public and educational psychology textbooks targeted for undergraduate teacher trainees.

As with any bureaucratic organization, along with the provisions and perks comes a predictable share of periodic proddings. Such proddings include the seemingly eternal internal program plans and "stick-to-the-budget-and-timelines" castigations, as well as the infernal external quarterly reports and site visits. In retrospect, program-plan and quarterly-report deadlines provided the much-needed impetus to complete research reports and theoretical syntheses of the research, much the same way as are afforded by grant-competition and convention-proposal deadlines. Also in retrospect, the frequency and amount of paperwork that had to be generated in the name of nonacademic "administrivia" represent Center activities that are less than fondly remembered.

Yet, after all has been said and done, it cannot be denied that my involvement with the Wisconsin Center for Education Research was an incredibly enriching one, certainly for me, hopefully for educational research, and maybe, in some small way, for educational practice.

Selected Publications

Levin, J. R. (1972). Comprehending what we read: An outsider looks in. *Journal of Reading Behavior, 4*, 18-28. [Also in H. Singer & R. B. Ruddell (Eds.). (1976). *Theoretical models and processes of reading* (2nd ed.). Newark, DE: International Reading Association.]

Levin, J. R. (1976). What have we learned about maximizing what children learn? In J. R. Levin & V. L. Allen (Eds.), *Cognitive learning in children: Theories and strategies*. New York: Academic Press.

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Levin, J. R. (1986). Four cognitive principles of learning-strategy instruction. *Educational Psychologist, 21*, 3-17.

Joseph T. Lawton

Professor, Department of Child and Family Studies

University of Wisconsin-Madison

Professor Lawton received his M.Ed. from Manchester University, England, in 1969, and his Ph.D. from Leeds University, England, in 1974. In 1974 he became an Assistant Professor of Child Development in the Child and Family Studies Program at UW-Madison. In 1978 he became an Associate Professor, and since 1980 has been a Professor of Child Development at UW-Madison. From 1975–78 he was a Principal Investigator/Faculty Associate in the Wisconsin Research and Development Center for Cognitive Learning and Coordinator of the Child and Family Studies Program at UW-Madison from 1978–81. Professor Lawton has served and continues to serve as a member of several editorial boards—Child Development, Journal of Structural Learning, *and* Annual Editions. *In 1981 he received the Palmer O. Johnson Memorial Award for Outstanding Research from the American Educational Research Association.*

I first became aware of the Wisconsin Research & Development Center while still at Leeds University, England. I came across a copy of a special edition of the *Journal of Experimental Education* sometime, I recall, in the fall of 1970 or 1971. The special edition was edited by Herb Klausmeier and George O'Hearn. This special edition of the *Journal* contained a description of the structure and function of the Wisconsin Center at that time, along with reports on some of the research being conducted at the Center. I was particularly interested in the research since, in part, it reflected certain of my research interests. I corresponded with Herb to find out more about the Center and the research program. At some point in our correspondence Herb invited me to visit the Center if I ever took it in mind to visit the United States. I did, in fact, pay a visit to America in the early fall of 1973 and made a point of coming to Madison. Although I did not realize it at the time, in more ways that one, my interest in the Center and my decision to pay a special visit in 1973 was to have a major impact on the lives of my family and myself. While in Madison, apart from being made very welcome to the Center by Herb, I met Professor Frank Hooper, then also a Faculty Associate of the Center, who invited me to interview for a tenure-track position in the Child and Family Studies Program. More out of curiosity than with serious intent I decided to interview. In the spring of 1974 I received a long-distance telephone call from Dean Chioni, then acting as an interim Dean for the School of Family Resources and Consumer Sciences, offering me the position. In the fall of 1974 I joined the UW faculty.

During the spring of 1975 I met with Dick Rossmiller, then Director of the Center. He invited me to submit a proposal for an intended research program that might fit into the overall mission of the Center. This was accepted, and I was invited to join the Center in the fall of that year. My term as Faculty Associate in the Center lasted from 1975 to 1978. From the start, I was impressed by and appreciative of the tremendous support facilities for research supplied by the Center. I was able to continue in a much more expanded fashion the research program I had begun in England prior to coming to the United States.

During the period 1975 to 1978 I completed a longitudinal study of the use of advance-organizer instruction on children's learning of social studies concepts. This study replicated and expanded to a considerable extent research I had previously completed at Leeds University in England. The study was conducted during one school year in the Belleville and Mount Horeb public schools with children aged 6 to 10 years and was entirely funded by the Center. I should add that I was on a pretty slim budget for that particular project and, at a time when I was in jeopardy of not being able to complete the study for lack of funds, I was bailed out by Tom Romberg with dollars from his project. I experienced a great deal of collegial support from other faculty associates during the three years I spent with the Center. A report of the study was published in the *American Educational Research Journal* in 1979 and, on account of that study, I received the American Educational Research Association Palmer O. Johnson Memorial Award for Outstanding Research in 1981.

The second major project begun in 1975 was a two-year longitudinal study of the effects of instruction on preschool children's understanding of logical concepts, as described by Piaget. This study was supported in part by the Center and in part by the University of Wisconsin Graduate School Research Committee.

Although a decision was made in 1978 to terminate support of my research at the Center, this study was completed with funding from the Graduate School Research Committee. This study led to a related three-year longitudinal study, also supported in large part with funding from the Graduate School Research Committee, which both replicated and expanded on the initial study.

For the two major studies begun in the Center, one of which was completed during my tenure as a Faculty Associate, I received considerable funding. This allowed me to hire necessary support personnel such as research assistants and a research coordinator. I was also able to purchase the services of the Center's media and computer programs. I would estimate that I received in the region of $80,000 dollars in support during my three years with the Center. Although I would have appreciated continuing funding from the Center, the support I received during my first three years allowed me to establish what has been over the past 16 years a rewarding research program focusing on young children's development and learning. Various related projects, stemming from my early research at the Center, have examined the effects of instruction on children's development of an understanding of logical concepts, the learning of subject matter concepts and general rules for the processing of information, the development of prosocial skills, and the dependencies between teacher and child communication during learning activities. Apart from a considerable number of reports in journals representing my field of research, the results of these studies have been regularly presented at both national and international conferences.

Selected Publications

Lawton, J. T. (1977). The use of advance organizers in the learning and retention of logical operations and social studies concepts. *American Educational Research Journal, 14*, 25-43.

Lawton, J. T. & Burk, J. B. (in press). Effects of advance organizer instruction on preschool children's prosocial behavior. *Journal of Structural Learning.*

Lawton, J. T., & Fowell, N. (1978). Effects of advance organizers on preschool children's learning of math concepts. *Journal of Experimental Education, 47*, 76-81.

Lawton, J. T., & Fowell, N. (1988). A description of teacher and child language in two preschool programs during small group instruction. *Early Childhood Research Quarterly, 4*, 407-432.

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Lawton, J. T., & Wanska, S. (1979). The effects of different types of advance organizers in classification learning. *American Educational Research Journal, 16*, 223-239.

Swadener, E., & Lawton, J. T. (1982). Effects of expository and guided self-discovery instruction on preschool children's learning of logical concepts. *Journal of Structural Learning, 7*, 35-54.

Penelope L. Peterson,

Professor, Department of Educational Psychology and Teacher Education

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Penelope L. Peterson received her Ph.D. from Stanford University in 1976. She is Professor of Educational Psychology and Teacher Education at Michigan State University. Previously, she was The Sears-Roebuck Foundation-Bascom Professor in Education at the University of Wisconsin-Madison. Currently, she is Co-director of the Institute for Research on Teaching and the Center for the Learning and Teaching of Elementary Subjects at Michigan State University. In addition, she is a senior researcher in the Center for Policy Research in Education (CPRE) funded by OERI. In her CPRE work Peterson is examining the relationship between new roles for teachers and classroom practice in restructured schools. She is also co-directing with David Cohen an OERI- and NSF-funded study of the effects on classroom practice of the state-level reform of elementary school mathematics in California.

In 1980 Dr. Peterson received the Palmer O. Johnson award given by the American Educational Research Association (AERA) for her article on teachers' decision making during interactive classroom teaching. In 1986 she received the Raymond B. Cattell Early Career Award for her outstanding programmatic research on effective teaching and student mediation of instruction. The programmatic research on students' thinking was work that she carried on while she was affiliated with the Wisconsin Center for Education Research from 1976 to 1986. She is the editor of the Review of Educational Research, *a major journal of the American Educational Research Association, and is AERA Vice-President for Division C (Learning and Instruction), the largest Division of AERA. She has served as a member of the consulting and writing team for the Holmes Group, a consortium of Schools of Education of major research universities that are engaged in a reform of teacher education, and she has been a consultant to the National Board for Professional Teaching Standards. Currently, she is a member of the National Academy of Sciences Study Panel on the Use of Volunteers in Schools.*

I joined the Wisconsin Center for Education Research in September, 1976, at the same time that I joined the faculty at the University of Wisconsin-Madison as an Assistant Professor of Educational Psychology. I was familiar with working within a major federally funded national R & D Center because, as a graduate student at Stanford University, I had conducted research on teaching with Nate

Gage, Richard Snow, and a team of talented graduate students in the Stanford Center for Research on Teaching. Like the Wisconsin R & D Center, the Stanford Center for Research on Teaching was one of the ten R & D Centers funded originally in 1965. I was aware of the advantages of working within a federally funded Center context including the possibility of long-term, sustained support for programmatic research, a supportive environment for collaborative research, and the availability of support and facilities including copying, mailing, computer services, editorial and art work. Indeed, these factors turned out to be critical to my development and productivity as an educational researcher.

From the very beginning of my WCER work, I was interested in ways of adapting or changing traditional teaching approaches to encourage the development of students' understanding, thinking, and problem solving. In the late 1970s, like many other researchers on teaching, I defined the relevant student outcomes in terms of "lower-level" and "higher-level" achievement. In one phase of my work in the Center (1976–84), I focused on ways of adapting direct instruction in secondary social studies and in elementary mathematics to encourage higher-level achievement by students with different levels of knowledge and abilities.

In elementary mathematics, we experimented with adapting the direct instruction (active teaching) model so that students worked on their seatwork in small groups rather than individually. We worked with real elementary teachers in real schools who tried out this small group adaptation of active mathematics teaching. Some teachers used the small group variation of active mathematics teaching while other teachers used the original individual seatwork model of active teaching to teach the same two-week mathematics unit. We found that the effectiveness of the small group variation of active mathematics teaching depended significantly on the kind and quality of discourse that occurred in the small group. We analyzed the discourse that occurred in small groups of second- and third-grade students working together in a mixed-ability cooperative math group on their seatwork.

In one exchange, two children challenged a boy's answer to a worksheet item, and they proved to him that his answer was incorrect by making their mathematical thinking visible to him. The boy thought aloud, counted aloud to himself, and proved to himself that the other children's answer "made sense" and was indeed the correct answer. Although getting the answer to a worksheet item might be defined as a lower-level mathematics task, the kinds of checking, challenging, and proving in which the students engaged reflect good mathematical thinking—the kinds of thinking that are needed for all kinds of mathematical tasks. The three children may have learned not only the correct mathematics answer, but also ways of thinking and strategies for checking and proving their solutions to mathematics problems.

In a second phase of my work in the Center (1980–87), I explored what and how students were thinking in the context of ongoing classroom instruction in elementary mathematics. Following each lesson in which the teacher taught

elementary mathematics using direct instruction, we showed videotaped parts of the lesson to students and interviewed them individually about what and how they were thinking during classroom instruction. We found that children's retrospective reports of attention, understanding, and thinking during direct instruction in elementary mathematics were better predictors of their mathematics achievement at the end of a mathematics unit than were observers' judgments of students' attention during classroom instruction. Compared to lower achieving students, higher achieving students reported engaging in more of what we called specific thinking processes: checking answers, applying information at a specific level, reworking mathematics problems, rereading directions or problems, relating new information to prior knowledge, asking for help, using aids, using memory strategies, and trying to understand the lesson or to do a problem by using a specific mathematics operation.

Interestingly, we found that many elementary students did not report using some specific kinds of effective strategies. We designed an intervention in which we gave elementary teachers instruction on how to teach students to use several thinking skills in their mathematics learning. In the thinking skills intervention, teachers received instruction in how to teach their students the strategies of defining and describing, thinking of reasons, comparing, and summarizing. In the learning time intervention, teachers received instruction in how to increase students' engagement and academic learning time. We found that lower ability classes did better on a mathematics problem solving test in the learning time intervention than in the thinking skills intervention, while higher ability classes did better in the thinking skills intervention than in the learning time intervention. Observations and transcripts of classroom interactions showed that thinking skills teachers of lower ability classes were less effective in implementing thinking skills than were teachers of higher ability classes. Other analyses that looked at the effects of students' ability level within their class showed that lower ability students benefited more from the thinking skills intervention than from the learning time intervention. Perhaps when taught effectively, the thinking skills gave lower ability students ways of thinking about mathematics problems that higher ability students already knew. Once provided with these strategies, lower ability students were able to use these ways of thinking to facilitate their mathematics problem solving.

After completing the above series of studies on students' thinking, I took a more domain-specific view of students' mathematical thinking in my work from 1984–89 with Thomas Carpenter and Elizabeth Fennema (See Carpenter, this volume). In this research we showed the importance of teachers' knowing and understanding their students' mathematical knowledge and understanding in order to facilitate their children's mathematical problem solving abilities. Our work also points to the need for researchers to focus on teachers' knowledge and thinking even as they study the development of children's mathematical knowledge and thinking in the teacher's classroom.

Throughout my tenure and more than ten-year association with the Wisconsin Center for Education Research, my scholarly work and research were enhanced by the many collaborative relationships that I developed with colleagues and the constructive conversations that I had with faculty, staff, and students. The faculty with whom I conducted sustained, programmatic collaborative research included Louise Cherry Wilkinson, Elizabeth Fennema, and Thomas Carpenter. In addition, I edited a volume on the *Social Context of Instruction: Group Organization and Group Processes* (1984) with Maureen Hallinan and Louise Cherry Wilkinson, and a monograph on *Learning Mathematics from Instruction* (1988) with Thomas Carpenter. Herbert Klausmeier and Thomas Romberg played important roles in mentoring me early on in my Center work. Also, the Center's and NIE/OERI's support for graduate assistants over a sustained period of time allowed me to develop productive collaborative working and learning relationships with graduate students. I served in a mentoring role in helping the graduate assistants learn how to do educational research, but we learned collaboratively as we conceptualized and conducted the research and then tried to figure out what we then "knew" as a result of our scholarly work. The graduate students with whom I worked in such a way included Terence Janicki, Marc Braverman, Susan Swing, Karen Stoiber, Janet Lindow, Megan Loef, and Chi-Pang Chiang.

It is only now, as I reflect back on my years working in the Center, that I see more clearly what I realized only vaguely then. My own knowledge, understanding, and thinking were deepened and enriched immeasurably by the sustained, programmatic research activities and the collaborative relationships that I developed and that were supported within the context of the Wisconsin Center for Education Research. I would not be the same person and scholar today had I not had those opportunities and experiences.

Selected Publications

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Gary G. Wehlage

Professor, Department of Curriculum and Instruction

University of Wisconsin-Madison

Gary Wehlage received a B.A. from Augustana College (SD) in 1958, an M.A. from the University of Illinois in 1962 and an Ed.D. from the University of Illinois in 1967. He was a history major as an undergraduate and subsequently taught history and economics at Urbana (IL) High School for several years. While teaching, he began work toward his doctorate in Social Studies Education at a time when the University of Illinois had a number of outstanding professors in the school of education including B. Othaniel Smith, William O. Stanley, and Lawrence Metcalf. Also on the staff was John Palmer who would soon leave for the University of Wisconsin and eventually hire Dr. Wehlage in 1967 to help develop the secondary social studies program in the Department of Curriculum and Instruction. Wehlage is currently Associate Director of the National Center on Effective Secondary Schools in WCER at the UW-Madison.

The structure of scientific inquiry as a model for curriculum and instruction was a central issue during the late sixties, and my doctoral dissertation had focused on several logical problems in the inquiry process. These problems included the nature of explanation in history and social science and the implications for curriculum. I published a book in this area shortly after coming to Wisconsin, but my interest in a rigorous social science model of inquiry began to pale the more I learned about the indeterminate nature of scientific knowledge and the processes of constructing it. I came to the position that there is something fundamentally different about natural science knowledge and social science knowledge. As this view matured in my thinking, I became less interested in research that produced correlational knowledge and more interested in the processes of "verstehen" that underlie history, anthropology, and certain branches of sociology and psychology. The search for an understanding of human action and purpose, in turn, led me to emphasize qualitative methodologies in my research on educational questions.

The intersection of my research interests and WCER occurred in the late seventies when Tom Popkewitz, Bob Tabachnick, and I were asked to study Individually Guided Education in selected elementary schools. Tom Romberg was conducting an extensive evaluation of IGE, and he believed it was important to have a qualitative study of this school reform program to supplement the rather sizable quantitative data set being collected from the many schools that had adopted IGE's administrative and curriculum model. We eventually selected six

elementary schools scattered around the country for intensive study to determine what happens in practice, not only to the particular reforms contained in IGE, but to gain a more general understanding of the school reform process.

At the time of our study, there was an embryonic body of implementation literature, and at least some of it emphasized the concept of "levels of implementation." These levels concerned degrees of fidelity to a reform program and implied that as understanding of a program increased and implementation became more rooted and sophisticated the result would be greater fidelity to the model's procedures, content and intent. We found that the concept of levels of implementation was simplistic and often did not fit the data. In general, our finding was that schools did not adopt or even adapt IGE, but rather it was incorporated, revised and even transformed by the institutional context into which it was imported. In *The Myth of Educational Reform*, we identify three institutionalized forms of schooling which shaped not only IGE but which characterized the whole school; i.e. the styles of work by staff and students, the conceptions of knowledge held by staff, and the professional ideologies which defined teaching. The three forms of schooling—technical, constructive and illusory—served to modify ideas and practices from IGE and transformed them into a school culture that in some instances was not intended by those who had developed the reform program.

Subsequently my interest in the problem of school reform moved to the issue of high school dropouts. My interest in what eventually became known as "at-risk" students came at a time when little note was being made of the dropout problem. But by 1979, I had been in enough schools to be convinced that for many students school was a very unhappy experience, and for good reason. The institution was set up to reward only a few while the environment created relationships between staff and certain students that were hostile and produced alienation for both. The result was often a consensus among staff that the school would be better off without this group of low achieving students who were mostly poor and/or minority. I was convinced that there was need for research that focused on the school and how it might better serve those at-risk of dropping out.

With some difficulty two colleagues and I acquired modest funding from the state of Wisconsin through the Governor's Employment and Training Office to conduct a series of studies on the dropout problem. The first was a study of four high schools in the state, two upper middle class high schools and two blue collar high schools. In each pair, one school had a high dropout rate and the other had a low rate. Of course, the question was different in each case; why would an upper middle class school have a high rate, and why would a blue collar school have a low rate? Through direct observations and interviews, we were able to document quite different policies, practices and social relations between staff and students in each pair of schools. Moreover, despite social class differences, the institutional character of the two high dropout schools was similar as was the character of the two low dropout schools. This initial study began the development of a conceptual framework and methodology for examining the character of schools

in relation to at-risk students. It also led to an effort to translate our framework and research into school reform programs, and for three summers we worked with staff from various Wisconsin schools interested in developing interventions in response to their at-risk populations.

After a hiatus in my relationship with WCER, I returned in 1985 to work with Fred Newmann, Mike Smith, Bill Clune and Mary Metz on the conception of a "secondary school center" that could win the OERI competition for a five-year program of research. We had obtained a planning grant from OERI to write our proposal and this support gave me time to explore some new dimensions of the dropout problem. Along with Bob Rutter, a former graduate student, I wrote an article based on the new High School and Beyond data. It appeared in *Teachers College Record* with the title "Dropping Out: How Much Do Schools Contribute to the Problem?" I mention this article because it received rather widespread attention in academic circles and succeeded in moving the discussion beyond the characteristics of at-risk students to the conditions of schooling. In this article, the same theme I had been emphasizing in other articles based on qualitative data was revisited; i.e., the quality of social relations between students and staff are an important factor in the dropout rate. However, this time in advancing this thesis I used "hard" data which have a credibility that "soft" data do not, at least for some people.

Our proposal to OERI was successful in obtaining the $5.5 million grant to establish the National Center on Effective Secondary Schools, and consequently I was launched into a major research effort on effective programs and policies for at-risk students. By Spring 1986, the first phase of my research was underway, focusing on a set of 14 schools that satisfied certain indicators of effectiveness with students characterized as potential dropouts. The research design included a student attitude questionnaire, writing and reading tests, school performance data, and in-depth interviews and classroom observations. The staff consisted of Greg Smith, a graduate student, Bob Rutter and Nancy Lesko, both academic staff, and Ricardo Fernandez, a professor from UW-Milwaukee who was on leave for the year.

The upshot of our research on the fourteen schools was *Reducing the Risk: Schools As Communities of Support*. A number of points were made in the book, but two stand out. One was the diversity of students who were at risk of dropping out; many of the young people we studied were quite competent academically but found school unsatisfying, or worse they found conventional schools hostile environments. A second was the "theory" of dropout prevention that emerged from our interpretations of what made these schools effective. In its basic form, the theory contends that success in school is essential if students are to stay, that such success is built on acquiring a sense of "school membership" and becoming "engaged" in the school's work. Membership and engagement are interactive, and to the extent students are alienated from membership they will not be engaged in achieving the formal goals of the school.

While completing this phase of my research, I became involved with the Annie E. Casey Foundation which has undertaken a challenging social experiment designed to address the needs of at-risk youth. The foundation selected five cities which are to receive in excess of $50 million over five years as part of an effort to build community-wide initiatives for at-risk youth. The Casey program is much more than a school reform effort, but it does focus much of its attention on schools, and I was asked by the foundation to direct my research toward the problem of developing effective schools for at-risk students in the selected cities. The additional funding and access to these schools has given me an opportunity to further develop the theory of dropout prevention, to create a student and teacher questionnaire based on the theory, and to link a variety of student performance indicators with systematic observations and interviews about the quality of school environments.

Given that the Casey Foundation is prepared to support a long-term program of intervention in the five cities, and that they see a need to provide for continuous evaluation and research, I expect to continue working through WCER for some time. It has been a stimulating and productive relationship for me, and I especially appreciate the various forms of support provided by WCER staff over the years. It has been a good place to work.

Selected Publications

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Louise Cherry Wilkinson

Dean, Graduate School of Education

Rutgers University

Louise Cherry Wilkinson was Professor and Executive Officer of the Ph.D. program in Educational Psychology at the Graduate School-CUNY, and Professor and Chair of the Department of Educational Psychology at the University of Wisconsin-Madison. Her extensive research on children's language has generated more than 70 book chapters and articles on classroom communication and learning. She is co-authoring Interacting for learning in classrooms *and has*

edited/co-edited Communicating in the classroom *(1982),* The social context of learning *(1984), and* Gender influences in the classroom *(1985) (Academic Press). She serves on the editorial board of three major journals in language development and education and is series editor of* Rutgers Symposia on Education *(Prentice Hall). She was elected Fellow of the American Psychological Association and has served on national review panels for the U.S. Department of Education. She was elected to the Executive Committee of the Organization of Instructional Affiliates of AERA, serves on the Executive Committee of Division C, and is Chair of the Committee to Recognize Outstanding Student Research. She received her B.A. from Oberlin College in psychology and her Ed.M. and Ed.D. degrees from Harvard University.*

In 1977 I joined the Center, which supported my work until I left the University of Wisconsin-Madison in 1984. The focus of my work was on children's communication with each other in small-group learning activities in elementary school. I chose this area to study because, at the time, a consensus was emerging among developmental psychologists that social interaction was the most significant context for stimulation of children's learning and development of cognitive, social and linguistic knowledge.

It has only been in the last decade that the significance of collaborative interactions among children emerged as a prominent theme in constructivist approaches to children's learning and development. The theoretical roots for this approach can be found in the work of both Piaget and Vygotsky, who viewed the genesis of conceptual development to be essentially social in nature. This approach suggests the importance of systematically studying students' communication with each other about content such as reading and mathematics. These studies provide insight about the mathematical ideas and construction of knowledge that students have, and how they are able to modify that knowledge in light of the experience of questions, challenges, explanations, and disagreements (among other uses of language) provided by other students.

The Center supported three aspects of my work on young children's communication in classrooms: (1) production of a series of three edited scholarly volumes on classroom interaction; (2) the development of conceptual models; (3) original empirical research on those models.

My specific theoretical orientation was sociolinguistic. This approach was born in the early 1970s and focused on the language used by teachers and children in classrooms. This approach includes the fine-grained descriptions and analyses of what students actually say during interaction to reveal the underlying social, cognitive, and linguistic processes. Initially, the expectation was that the descriptions would provide a richer understanding of life in classrooms, revealing the diversity of children and the complexity of communication. These descriptions can serve as reference points for the improvement and/or evaluation of specific education programs; in addition, the descriptions have the potential to serve as a source of new ideas for investigating the processes of teaching and learning.

My initial research at the Center was on students' interaction in all-student groups in mathematics and in reading in first, second, and third grades (e.g., Wilkinson & Calculator, 1982; Wilkinson & Spinelli, 1983). I developed the concept of the *effective speaker*, who uses knowledge of language forms, functions, and contexts to achieve communication goals. Subsequently, using observational research techniques (e.g., audio-video recording of classroom communication) my students and I systematically examined the characteristics of effective speakers, identifying the following dimensions of requests produced by especially skilled students: direct requests that were on-task, perceived as sincere, and addressed to one designated student. The findings from these earlier studies lend support to the constructivist position. For example, we found that students' reading and mathematics achievement was positively correlated with their ability to get other students to respond to their questions in small groups. We discovered the key role of "task-master" that emerged in all-student groups. Task-masters were defined as students who consistently paced other students in the group and helped the group to manage time efficiently, keep on track, resolve disagreements, and get the task done on time (Peterson, Wilkinson, Spinelli, & Swing, 1984). In subsequent work, my students and I explored what children know about how to use language effectively and appropriately in classroom activities, including uses of language that seemed to be central to learning of content such as mathematics and literacy—explanations, disagreements, requests.

In a line of collaborative work with Penelope Peterson and our students, we combined a sociolinguistic approach with the more traditional process-product paradigm to examine the relationship between learning and small-group communication in an elementary mathematics class. Specifically, we looked at the communication that followed a verbal assertion of disagreement about a mathematics answer, including the relationship of mathematics ability and achievement and four aspects of disagreements: who initiated it, who participated in it, whether children demonstrated the validity of their positions and how the disagreement was finally resolved (whose answer prevailed at the end of the disagreement). The results showed that high ability mathematics students had significantly more prevailing answers and demonstrations. Participation, demonstration, and prevailing answers were all positively related to students' attributions of the mathematical competence of their fellow students. Prevailing answers were also positively related to students' achievement. The results of our studies also lend support to the constructivist position: that high achieving children actively communicate with other children about mathematical problem-solving. Whether this relationship is correlational or causal (and in which way) remains to be discovered. One of the major findings emerging from the process-product studies is that receiving no response or a terminal response to a request for help is negatively related to student achievement. Therefore, the ability to produce effective requests, that is, those that result in receiving the information/action requested, is a crucial skill for children to have if they are to learn in small groups.

I valued the Center's sponsorship of my research while I was on the faculty at Wisconsin. In particular, I found the opportunities for collaboration with faculty from different theoretical perspectives to be a major advantage of working at WCER. The corpus of research that I generated at WCER forms a major component of a volume that I am working on now with my colleague Elaine Silliman. Our book, *Interacting for Learning in Classrooms*, brings together original research from diverse perspectives on the social nature of learning; the audience is primarily speech/language clinicians and school psychologists.

Selected Publications

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Cora Bagley Marrett

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The pioneering work of Elizabeth Fennema on women and mathematics led—admittedly indirectly—to my involvement with the Wisconsin Center for Education Research. The National Institute of Education (NIE) called on Fennema and two other scholars to review the research on girls' achievement and participation in mathe-

matics; their recommendations formed the basis of a grants program that NIE launched in 1978 and 1979. The announcement of the program drew my attention. Although I had not conducted research on women and mathematics, I had spent time examining the status of women in the sciences. I had not studied schools, but I had conducted analyses on other types of organizations. Concluding that the NIE initiative offered me the chance to combine my interest in organizations and their effects with my concern about gender and mathematics-based fields, I applied for a grant through WCER. The grant funded a project on "Minority Females in High School Mathematics and Science" that sought to determine the patterns of enrollment, by gender and race, in advanced courses and the ways in which those patterns varied across different schools.

The project surveyed over forty high schools from throughout the nation. Although it yielded information on enrollment, it offered limited cues about the teaching and learning of mathematics and science. My second study through the Center—"Teacher Goals and Race/Sex Equity in Mathematics and Science"—used classroom observations, teacher and student surveys, and student grades and test scores to develop a picture of both the content and the context of mathematics and science education. More concretely, I wanted to know how the goals teachers set for themselves influenced their teaching strategies, and how the goals and strategies related to student attitudes and achievement.

As the project neared its end, researchers at the Center and elsewhere on the campus organized to plan for the new centers competition. I joined with the group that developed a proposal for a National Center on Effective Secondary Schools. My part of the activity: to review the literature on organizations, and especially on schools as organizations, to identify conditions likely to foster higher order thinking among students. With this activity, my interest in organizations again became paramount.

Through publications, conference presentations, and an array of committees my work and ideas about gender, race, and mathematics-based fields have come to the attention of persons far beyond the boundaries of the campus. That work led to my membership on the Committee on Research in Mathematics, Science and Technology Education at the National Research Council (NRC) and on the Advisory Committee for the NRC Office of Scientific and Engineering Personnel. It prompted as well my appointment by the Wisconsin Superintendent of Public Instruction to the Steering Committee of Science World, a statewide program, and my participation for two years on the National Advisory Committee on Computer Equity that the Educational Consortium of Ohio established.

Selected Publications

Marrett, C. B. (1987). Black and Native American students in precollege mathematics and science. In L. Dix (Ed.), *Minorities: Their underrepresentation and career differentials in science and engineering* (pp. 7-31). Washington, DC: National Academy of Sciences.

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Fred M. Newmann

Professor, Department of Curriculum and Instruction

University of Wisconsin-Madison

Fred M. Newmann received a BA in American Studies from Amherst College in 1959, a Master of Arts in Teaching Social Studies from Harvard University in 1960, and an Ed.D. from Harvard in 1964. He has worked as a high school social studies teacher, curriculum developer, teacher educator and researcher. He was Assistant Professor of Education at Harvard, 1964–68. Since 1968 he has been Associate and Professor of Curriculum and Instruction, University of Wisconsin-Madison where he directed the Training of Teacher Trainers Program (1970–73) and the National Center on Effective Secondary Schools (1985–90).

Professor Newmann has served on national advisory committees dealing with social studies, law-related education, civic education, high school reform, and research on high schools. He was President of the Social Science Education Consortium, 1985–86, and recipient of the Career in Research Award from the National Council for the Social Studies, 1988.

His research interests include social studies curriculum for participatory citizenship, student engagement and alienation in high school, the relationship of education to building community in modern society, higher order thinking, and authentic assessment.

My earlier experiences in teaching high school social studies, in supervising student teachers, and developing curriculum to help students analyze public issues and to participate in civic affairs raised four critical problems which have guided my work since I joined WCER in 1980. Perhaps the most central issue is mindlessness—the persisting paradoxical tendency of formal education to subvert intelligent use of the mind. It happens quite unintentionally, I think. There seem to be good reasons for each separate worksheet and test that students complete, each separate course that policymakers mandate, each lesson that teachers plan, each text developed by publishers, and each method for organizing teachers' and students' lives in schools. Yet, sadly, the net result for students and teachers is a

massive effort to master a set of routines that prevent us from using our minds to create something of value—through speaking, writing, and use of our hands.

I have attacked this problem through different routes, summarized in the themes of student engagement, authentic achievement, community, and thoughtfulness. How should we respond to the symptoms of disengagement—a national high school dropout rate of more than one million students per year and the clouds of boredom endured by most of those who stay even to "succeed." Since 1985 I have been working with colleagues at our National Center on Effective Secondary Schools to understand more about what schools can do to increase student engagement in academic work and thereby to elevate achievement. We have developed a theoretical model of what contributes to student engagement and, through five research projects, we have explored different aspects of the model. The projects deal with special programs for engaging students at risk; the effects of ability grouping and tracking; the promotion of higher order thinking in the curriculum; the quality of teachers' worklife; and the effects of adolescents' noninstructional experiences in the family, the peer group, extracurricular activities, and on the job. A book on these topics, *Student Engagement and Achievement in American High Schools*, is being prepared.

The sources of mindlessness and disengagement may be found in the kinds of accomplishments that count for success in high school. When we ask about the value—to the student or anyone else—of the tests, the papers, the laboratory work, and the discussions that serve as indicators of students' success or failure, we often come up short. They may be defended as exercises necessary to learn the material of school, but the specific performances used to certify competence rarely have utilitarian or aesthetic value beyond that. Thus, it's all too easy to characterize many school achievements as contrived, meaningless, irrelevant, or insignificant. This issue gains in importance as society puts more pressure on schools to demonstrate student outcomes through district, state and national testing. To offer an alternative to common conceptions of achievement and forms of testing, Doug Archbald and I developed a theory of authentic academic achievement and descriptions of promising practices in the United States and the United Kingdom. A practical version of this work has been published by the National Association of Secondary School Principals *(Beyond Standardized Testing: Assessing Authentic Academic Achievement in Secondary Schools)*, and a more complete analysis will be available in Harold Berlak (Ed.), *Assessing Achievement: Toward the Development of a New Science of Educational Testing.*

One way of enhancing the value of student accomplishment is to connect learning more directly to life in the community beyond school. And a way of engaging students in the activities of school is to improve the communal, caring qualities of the school itself. I have worked on each of these dimensions of building community. Prior to joining WCER I directed development and research on programs to involve students in community service and citizen action *(Education for Citizen Action; Skills in Citizen Action* with T. A. Bertocci and R. M. Landsness).

With WCER support, Robert Rutter and I completed case studies of eight exemplary high school community service programs in 1983, and in 1984 we completed the first national survey of high school community service programs to be based on a systematic stratified sample of U.S. high schools. My efforts on the topic of building community within schools included organizing an alternative high school in Madison, WI, in the early 1970s and analysis of the organizational features of a high school that affect teachers' sense of community, with WCER support in 1984-85.

Since 1985 the main focus of my WCER research has been the promotion of higher order thinking in high school social studies. This continues inquiry on critical thinking initiated in the Harvard Social Studies Project where I worked with Donald Oliver from 1961 to 1968 to develop a system for teaching and analyzing dialogue on controversial public issues. We also produced instructional case studies for students, and Xerox distributed over 7 million of these booklets before they were taken out of print in 1984. Several are being revised and published by the Social Science Education Consortium (Boulder, CO).

Recently I have extended the perspective of critical thinking well beyond analysis of public issues. We have proposed a comprehensive conception of the promotion of thinking which (a) synthesizes current research on the nature of higher order thinking and (b) applies to teaching a wide range of content within social studies. The ultimate goal of this research is to help social studies *departments*, not just individual teachers, to be more successful in promoting thoughtfulness among students of all backgrounds and achievement levels.

The research is still in progress, but thus far we have translated the conception of thinking into a scheme for classroom observation that assesses the level of thoughtfulness of each lesson according to several criteria, and we have developed new assessment tasks that indicate levels of student performance on higher order challenges in social studies. Using these materials we have studied the promotion of thoughtfulness in 16 high school social studies departments. The study includes interviews with teachers and administrators on the importance they place on the promotion of thinking and the difficulties they encounter, also survey, interview and test data on students' reactions to teaching that challenges them to use their minds.

The good news from this research is that some social studies departments do much better than others in promoting high levels of thoughtfulness among students of all achievement levels, and that the variables of classroom thoughtfulness we have identified *do* affect students' performance on higher order thinking tasks, even after controlling for students' prior achievement. The bad news is that social studies departments in general place little emphasis on higher order thinking and their students perform poorly. Future analyses will identify more precisely what contributes to departmental success and the extent to which key factors can be replicated in less successful departments.

Working within WCER has been a joy, mainly because of the rich opportunities for collegial interaction and the outstanding support services. The major

difficulty lies in the system of external funding which often interrupts sustained, long-term work. One walks a dangerous tightrope, trying to tailor the research agenda to fit changing funding priorities, while at the same time trying to maintain continuity and integrity in the research.

Selected Publications

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William H. Clune

Voss-Bascom Professor of Law

University of Wisconsin-Madison

William H. Clune is Voss-Bascom Professor of Law at the University of Wisconsin Law School, Director of the Wisconsin branch of the Center for Policy Research in Education (CPRE), a member of the Executive Board and faculty of the La Follette Institute of Public Affairs at Wisconsin, and co-director of the Wisconsin Center for Educational Policy (WICEP). His past research on education policy has included school finance, school law, implementation, special

education, and public employee interest arbitration. His present research with CPRE concerns the effects of graduation requirements and other student standards, school site autonomy, and regulation of the curriculum. He co-directed a conference on educational decentralization and choice for the La Follette Institute.

*Professor Clune began his research in educational policy studies shortly after Law School (Northwestern University) as co-author of a book (*Private Wealth and Public Education, *with Coons and Sugarman) which played a major role in the school finance litigation of the 1970s (e.g., the California case of* Serrano v. Priest*). Many states voluntarily adopted the model of fiscal equity recommended in this book; and shortly after arriving in Wisconsin, Clune consulted with Governor Lucey's Task Force on School Finance about school finance reform in Wisconsin.*

As a natural outgrowth of my interest in equitable finance, I became interested in what was then called the "cost-quality" issue, or how dollars could be spent to make a difference in student achievement. Under a grant from the Department of Education in the early 1980s, I wrote a series of articles about implementation of government programs, with a special focus on education (including one article on the implementation of two school finance decisions that took different approaches to educational reform and other articles and book chapters that examined implementation of federal laws and policies).

My association with the Wisconsin Center for Education Research began in about 1984 when Marshall Smith was Director of the Center. He and I cooperated in Wisconsin's part of the successful proposal for a 5-year grant from the Department of Education for the Center for Research on Policy in Education (CPRE). I replaced Smith as the Principal Investigator of the Wisconsin branch of CPRE when he took the position of Education Dean at Stanford. Wisconsin-CPRE is housed by WCER, and I have spent much of my time since 1985 heading a CPRE team of researchers on the 7th floor of the WCER building.

My work with CPRE has focused increasingly on how policy affects schools and student learning (thus completing the gradual shift in focus that began by asking how dollars could make a difference). For example, a major CPRE study of the effects of new high school graduation requirements found that middle and lower achieving students were most frequently affected and that schools added basic and general courses for these students, rather than the higher level academic courses that were intended.

Policy research focused on student achievement necessarily requires interdisciplinary contact with other researchers. Interdisciplinary research at WCER is greatly facilitated by the presence of multiple teams of researchers and the willingness of WCER Directors to look beyond the School of Education. Andrew Porter, Marshall Smith's successor as Director of WCER, also has a strong interest in educational policy and has joined me as a key participant in CPRE research.

Recently, I joined the faculty and the Executive Committee of the La Follette Institute of Public Affairs at UW-Madison. As an outgrowth of that association, Professor John Witte of Political Science and I sponsored a conference in

May 1989 dealing with issues of choice and decentralization in education (papers to be published by the Falmer Press in a two-volume work entitled *Choice and Control in American Education*). My conference paper, continuing a longstanding interest in educational vouchers, and a more recent interest in curriculum regulation, is titled "Educational Governance and Student Achievement."

A second development capitalizing on both the WCER and La Follette connections was the recent establishment of a Wisconsin Center for Educational Policy (WICEP), with myself and Dean Bowles of Educational Administration serving as co-directors. WICEP will conduct and disseminate research with relevance to educational policymaking in Wisconsin. A project with immediate significance is the WICEP collaboration with the newly formed Wisconsin Commission on Schools for the 21st Century.

Selected Publications

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4 Innovative Product Development and Research

What are educational products? One kind is an instructional program. An instructional program includes plans (for example, designs and prototypes) and materials (for example, textbooks and games) that are intended for use by teachers and students. Another large category of products includes the various components of schooling other than curriculum and instruction, for example, an organization for instruction or a program of home-school-community relations. These products include plans and materials that are intended for use by teachers, principals, and other practitioners, not by students.

In chapter 2 we saw that the various components of Individually Guided Education were developed both singly and in combination. The products pertaining to the components did not take their final form through a mere series of development activities such as occurs when one prepares a lesson plan or writes a chapter of a book. Neither were research-based conclusions put into a package of materials and then released for use. Instead, the development of products, such as the design and materials for Developing Mathematical Processes *and the program of home-school-community relations, was a systematic process, characterized by disciplined scientific inquiry.*

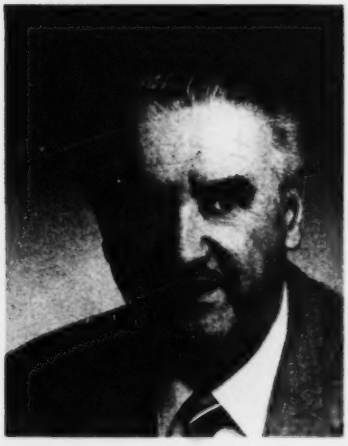
Though this is the case, no clearly established models or strategies for product development had been formulated in 1964 at the time the Center started operating. Those of us who were interested in product development exchanged ideas on how to proceed. We communicated with developers in other centers and in the regional educational laboratories. A global development paradigm emerged from this effort. The paradigm involves creating the design of the product, developing the first version of the product, and then carrying out iterations of formative evaluation and revision, followed by field testing and summative evaluation. By use of this paradigm in developing each Center educational product, we attempted to insure the product's usability and its effectiveness in attaining its stated objectives. Practitioners worked with the Center teams from the time of creating

the design through summatively evaluating the product. The highly talented staff of the Center Technical Section supported the development teams.

The Center teams did not limit their activities to development and development-related research. They also carried out knowledge-generating research to advance knowledge in their fields of interest. By the very nature of the development process, this new knowledge could not always be incorporated in the product under development.

The Center staff developed several major products from 1965 to 1976. Smaller teams developed less comprehensive designs and prototypes. In this chapter, six professors presently or formerly affiliated with the Center describe some of their product development, research, and other Center experiences. My invitation to them was open regarding what they would report regarding the product and its development, their knowledge-generating research, or other experiences. However, I indicated a maximum length for the narrative and a maximum number of publications that should be listed.

Before turning to the accounts, we should be aware that Center professors knew before starting their projects that any income that might accrue from the sale of the commercially published materials would go to the Center and be divided equally between the federal government and the Center. All monies from materials produced and sold by the Center would be retained by the Center. Despite this, Center professors and their development teams unselfishly dedicated many years to the development. In addition, the development paradigm that they formulated has gained the accolades of educational researchers and curriculum specialists in this country and abroad.



Lee Sherman Dreyfus

President, Lee Sherman Dreyfus, Inc.

Lee Sherman Dreyfus is a Wisconsin native who received his B.A., M.A., and Ph.D. degrees in communications from the UW-Madison. He left the state for ten years when he was professor and station manager at Wayne State University but returned to the UW-Madison in 1962 as professor and station manager for WHA-TV. From 1967 to 1979 Lee Sherman Dreyfus served as chancellor of the UW-Stevens Point. He ran successfully for governor of the state of Wisconsin, an office he held from 1979 to 1983. He served as President of Sentry Insurance Company in 1983 and 1984. He serves on the boards of public and private agencies across the country as well as in Wisconsin, including the Board of Regents of the University of Wisconsin System. Dreyfus is a member of Phi Beta Kappa, holds honorary degrees in Law and Humanities, was awarded the Distinguished Public Service Medal by the Secretary of Defense, and is listed in Who's Who in the World *and* Who's Who in America. *He is president of his own communications consulting firm.*

In 1944 in the midst of WW II, I was being trained to maintain our nation's most secret and most sophisticated electronic radar and sonar equipment. There was no hint that twenty years and three degrees later this fundamental electronic engineering knowledge would prove to be a key factor for my involvement in an exciting educational research and development project put together essentially by a group of pedagogical scholars at the UW School of Education. As is often the case, the separation of universities into colleges and departments tends to hinder or even eliminate communication and collegiality among faculty in disparate subunits of a large university such as the UW-Madison.

Two distinct and originally nonconnected educational forces were being set in motion on the Madison campus in 1962. Three distinct missions were set for me. Professor Fred Haberman, Chair of the then Department of Speech, gave me the directive to develop an academic program in speech with a concentration in the mass media. Professor Henry Ahlgren, Chair of the University Television Committee, directed me to develop a statewide *educational* television network. President Fred Harvey Harrington, Vice President Robert Clodius, and then Dean Edwin H. Young of the College of Letters and Science, gave me the directive and the resources to develop a University-wide *instructional* television program. It was the last thrust that would become important two years later when brought into coordination with another project being considered in the School of Education.

A group of professors headed by Herbert Klausmeier and including Dean Lindley Stiles, and Professors John Guy Fowlkes, Frank Baker, Chester Harris, Thomas Johnson, Burton Kreitlow, Julian Stanley, and Henry Van Engen had developed an exciting proposal for the establishment of an Educational Research and Development Center at Madison. The description of that Center and its missions is left to others who stayed with the Center. The proposal attracted national attention as well as interest for the needed initial and substantial funding. At one of the early funding meetings, Professor Klausmeier indicated that I had joined the L & S faculty and would be available for participation in the Center. Early in the 1960s, my general academic reputation centered around the use of radio and television for direct instructional purposes as a result of programs developed during the 1950s at Wayne State University in Detroit, Michigan. Courses for credit at the collegiate level by radio and television broadcasting had been successful. In 1962 I had produced the book *Instructional Television* with Wallace Bradley that was published by RCA and the Wayne State University Press.

By 1964 when Professor Klausmeier and colleagues invited me into their group, a portion of my administrative time, energy, and salary could be given over to the Center. The key reason for this reassignment was the fact that the State Educational Television Commission had completed most of its financial, technical, and (most importantly) political work. It was now only a matter of time and energy to complete the physical development of the statewide network.

Another factor that proved to be valuable was my inclusion, beginning in 1958, as a member of an AT&T Think Tank on the future of telecommunication. The world famous Canadian communications scholar, professor Marshall McLuhan, a long time friend and colleague, was responsible for that inclusion. The ideas generated in that group, the connection with AT&T engineers, and my administrative control over one of the finest state-of-the-art television operations then in existence proved to be great training and experience for involvement in the beginning stages of the Wisconsin R & D Center.

Theodore Nielsen, the key television producer-director on the staff of the university's WHA-TV, proved to have an instinct for working with faculty in a variety of disciplines to help them innovate and develop teaching techniques that enhanced learning. Professor Donald Bucklin, with encouragement and financial support from Dean Edwin Young, produced a collegiate level introductory zoology course under Nielsen's expert television direction. At the same time, Professor Henry Van Engen committed his energies to developing an instructional television text, if you will, to broadcast the so-called modern mathematics to schools within the signal area of WHA-TV. The R & D Center became the focus of activity that would test the effectiveness of the teaching theories and techniques of this nationally recognized scholar in mathematics education.

As knowledge of these activities spread across the campus, researchers from other disciplines became interested and involved. One of the earliest in my memory was a nationally distinguished colleague in the field of journalism and mass communication research, the late Professor Bruce Westley. Professor Westley, a member of the L & S faculty, developed a research technique that addressed the very heart of the teaching-learning process using the instructional television facilities as well as the R & D facilities. The fundamental question for him was how learning took place: how visual symbols resulted in cognitive understanding. He was in a sense dealing with the DNA molecule of the learning process. That research has never been fully appreciated, understood, or expanded on. It may yet prove to be one of the most important products to come out of the R & D Center during the 1960s!

My previous experience with extension courses by video led me to develop a mobile TV classroom that could be taken to the most remote and most rural school settings in Wisconsin to demonstrate for teachers, administrators, and children the learning improvement potential that could be realized through involvement with Van Engen's program. Today, more than twenty years later with a full statewide operational ETV system, plus ever expanding cable systems and the very easily operated VCR, all of this now seems obvious. Such was not the case in the mid-1960s. A basic Chevrolet truck was rebuilt by my staff, much of it on their own time, with funds provided by the Wisconsin R & D Center. The vehicle was designed specifically to permit children to come inside and become adjusted to an environment that hopefully would become standard in classrooms of the future. Much of it has! The Wisconsin Idea first touted the concept that the

boundaries of the campus are the boundaries of the state and, later, the boundaries of the nation and the world. Here was yet another example of the Wisconsin Idea. There was also inherent in this aspect of the Center a central theme that insisted that the research product of the institution was not simply to be written up and distributed to colleagues around the country. Rather, it was to be implemented. Success was defined in terms of that which improved the teaching and learning going on in schools and that which somehow benefited children. In some respects, I found that attitude refreshingly different from that of most of my L & S colleagues.

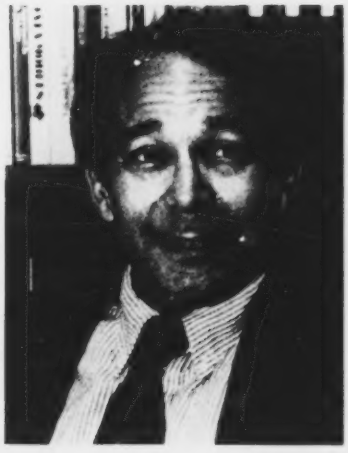
The early experiences and resulting interests created by this cross-fertilization between the School of Education and L & S led into experimentation with satellite utilization for intercontinental instructional purposes. One such demonstration provided the world's first transoceanic classroom interconnection on May 31, 1965, between West Bend, Wisconsin, and a suburb of Paris, France. The West Bend High School French class carried out a one-hour exchange with an English class at the Lyceum Henry IV in France. The American students were required to speak French, and the French students were required to speak English. The entire demonstration has been housed in the archives of the University of Wisconsin Library Mass Communications Center. Another intercontinental project that evolved out of the R & D Center resulted in the development of techniques for the utilization of *two-way* audio instruction carried on between the campus at Madison and very remote rural settings in the western part of South America. Professor Charles Wedemeyer of University Extension Education was my key colleague in this exciting teaching mode. Again, the R & D Center was the catalyst bringing about interdisciplinary cooperation, in this instance a three-way cooperation between the School of Education, the College of Letters and Science, and the University Extension Division. Later, when I served fifteen years in an administrative capacity as University Chancellor and Governor of the State, I developed a great appreciation for the magnitude of the contribution of this cross-fertilization made by the Center. Education fiefdoms are very resistant to that sort of thing; yet somehow, a genuine sense of collegiality was created that crossed many of the administrative boundaries and barriers, if you will, found in the University.

One last example of the far reaching effects of the Center must be added here. During my years of campus activity, I was involved deeply in the national effort to create a public broadcasting corporation funded by federal money. There existed great skepticism and even suspicion on the part of Congressional leadership about any federal involvement with radio and television networks that could become propaganda tools for the executive branch. A key national leader whose support was critical to passage of any such legislation was the Republican Assistant Minority Leader, Melvin Laird of Marshfield, Wisconsin. The task of persuading Representative Laird fell to me, then a member of the Board of Directors of the National Association of Educational Broadcasters as well as a citizen of the

state of Wisconsin. Laird was a solon known for doing his homework well before he became an advocate for legislation.

It was clear at the first meeting that he had considerable knowledge as well as some very deep reservations about the establishment of such a network. He needed to see some up-side benefits to offset the down-side risks of money and potential thought control. The standard fare of educational programming then available did not seem quite worth the risk. However, when he was informed of the instructional uses of television being developed and demonstrated by the University of Wisconsin through the auspices of the R & D Center and WHA-TV, he came around not only to a supporting position but actually to a strong leadership position. Melvin Laird was very familiar with the rural education settings of central and northern Wisconsin. His Congressional district was the largest in the state, reaching all the way from Wisconsin Rapids in the geographic center to the shores of Lake Superior in the north. The potential improvement of rural education, based on reported activities and projects of the Center, galvanized him into action. Particularly he was impressed with Professor Van Engen's *Patterns in Arithmetic*. Laird's conversion was critical according to Representative Al Quie of Minnesota, a leading advocate of the Public Broadcasting Act and later Governor of Minnesota. On November 7, 1967, President Lyndon Johnson signed the bill and created the Corporation for Public Broadcasting, NPR and PBS. I was present; however, Professor Klausmeier, Professor Van Engen, and all their colleagues did not know until this writing the key role their work played in helping to establish one of our great national services enjoyed by so many millions today.

In my opinion, there will never be a full accounting of the true impact of the R & D Center begun at the University of Wisconsin in Madison over twenty-five years ago.



Richard L. Venezky

Unidel Professor of Educational Studies

University of Delaware

Richard L. Venezky received his B.E.E. (1961) and his M.A. (1962) from Cornell; his Ph.D. (1965) is from Stanford. While in graduate school he was director of technical writing and a part-time programmer for Control Data Corporation in Palo Alto, California. He came to Wisconsin in 1965 as Assistant Professor of English, but also taught in linguistics and in computer sciences. Venezky was a Visiting Research Associate at Tel Aviv University in 1969–70 and in the spring of 1973. From 1974 until 1977 he was Professor of

Computer Sciences and served as department chairman from 1975 until 1977. In 1977 he became the Unidel Professor of Educational Studies at the University of Delaware. He was a consultant to the Oxford English Dictionary Supplement *and continues as advisor on data processing to the* Dictionary of Old English. *In 1984 he was a member of the U.S. Reading Study Team to the People's Republic of China.*

PRS (Pre-Reading Skills Program) developed from a series of studies initiated by Robert Calfee and myself during the period 1966–69. The beginnings of this collaboration occurred at Stanford University where Calfee and I met in 1964. At that time Bob was completing a post-doc with Richard Atkinson and I was finishing a dissertation in linguistics under the late Ruth Weir. In our one brief meeting we probably spoke no more than 15 minutes. That summer Bob left for the University of Wisconsin where he had accepted a position in the psychology department. A year later I followed, coming to the English department where I taught English linguistics and assisted Frederic Cassidy with the *Dictionary of American Regional English*, which he had just initiated. A chance meeting with Calfee late in the fall of 1965 led to several discussions about early reading and reading failure and the discovery of a mutual interest in exploring letter-sound learning and the various skills that facilitated this process.

We applied for support from the newly formed R & D Center and formally began work in the spring of 1966. Our interests were strictly in research; neither of us at that time imagined an involvement in program development or any other aspect of classroom instruction, and the Center required no such long-range commitment. At first we focused on letter-sound learning, tracing the development of general abilities to relate letters to sounds and also the development of specific phonic patterns. In the fall of 1967, Robin Chapman joined the project as a project associate and the three of us pursued a variety of studies on both letter-sound learning and the prerequisite skills for this ability. One of our early conclusions was that the variability that we observed in phonics ability derived not so much from the peculiarities of English orthography as from the lower level skills that underpinned this ability. We did, nevertheless, manage to explore a wide range of issues in the development of decoding ability.

The search for skills that were crucial not only for letter-sound learning but for all of early reading led us down a variety of paths, some of them quite productive and some dead ends. Among the latter were a series of forays into acoustical processing, including studies of articulation and phonemic discrimination. Contrary to the claims of many others, we found that most articulation errors in kindergarten and first-grade children represented natural developmental lags and were not causes of reading problems. Similarly, careful analysis of testing paradigms for phonemic discrimination revealed that the traditional same-different paradigm, on which some psychologists had built theories of phonemic deficits as causes of reading failure, was a faulty method for assessing phonemic discrimination.

By the end of the 1968–69 academic year we had isolated a group of skills in both visual and acoustical processing that related to reading success. We had, furthermore, found a number of valid procedures for assessing these skills. Throughout this period the Center provided a variety of supports for our work, including generous support of graduate students and hourly help and assistance in preparation of stimuli, location of subjects, and data analysis. The environment of the R & D Center was also conducive to the work we were doing. A further and perhaps more subtle advantage of working within the Center derived from the interrelationships that developed among the various R & D centers and laboratories around the country. Through this network we came to know researchers doing work similar to ours at several other locations, particularly the Learning Research and Development Center in Pittsburgh and the Southwest Regional Educational Laboratory in Los Angeles. A number of professional relationships that Bob and I maintain today originated from this network.

Early in 1969 Bob and I decided to take a year off and study pre-reading skills in some other culture, preferably one with an orthography vastly different from our own. Through the assistance of the Center we made arrangements to spend the year at Tel Aviv University and for me to follow this up with a shorter stay in Helsinki to collect data there on the development of letter-sound abilities in Finnish children. At roughly this same time Bob received an offer from Stanford University to join the education and psychology faculties there. The result was that I left for Tel Aviv University in the fall of 1969 while Bob went at the same time to Stanford to spend one semester before coming over to Israel for the spring semester. Our work there was highly exploratory, but it confirmed our speculations that the skills that we had isolated in the U.S. were just as important for learning to read Hebrew as they were for learning to read English. Similarly, the study in Finland showed that, even with a highly regular orthography, decoding problems existed among some learners (Venezky, 1972).

The Israeli experience was important for the exposure it gave to researchers, particularly at Tel Aviv University, who were not only doing studies of learning in the early school years, but who were also working cooperatively with kindergartens and elementary schools in the development of instructional programs and teacher training. I returned to UW and to the R & D Center in the fall of 1970 anxious to move the project, which had been managed by Robin Chapman in my absence, toward instructional development. At the same time the R & D centers nationally were being encouraged to demonstrate that their research efforts could result in improved school practices. Our staff at that time consisted of Robin and myself, plus Marga Hirsch, a linguistics major who had joined the project during the last year as a volunteer, and several graduate students, including Ron Leslie, who was working on a Ph.D. in psychology and had been with the project for several years already.

First, Robin and I drafted a needs and specification paper for a pre-reading program that remained for at least a year as a vague goal. Then, during the 1970–71 academic year we developed instructional procedures for five or six basic skills that our earlier studies had isolated, and tried these out in three cooperating kindergartens. After several improvement cycles we then turned the techniques and materials over to regular classroom teachers to try. All three teachers were particularly thoughtful in their assistance, but one, Susan Pittelman, would not only try the materials as we had specified, but would also frequently improve them, try them out again, and then tactfully explain where we had gone wrong and how the problem could be overcome. That following summer we hired Susan, and eventually she became director of the program development. The outcome of this initial phase was the decision to focus on two basic sets of skills—visual and sound—and to build a pre-reading skills program compatible with the IGE model of instructional programming for the individual student. At the same time we made significant progress on a pre-reading skills assessment battery, which by the end of the school year we labeled the Wisconsin Basic Pre-reading Skills Test.

The skills that we finally decided to teach included attention to letter order, attention to letter orientation, attention to word detail, sound matching, and sound blending. Activities for teaching these skills included whole-class, small-group, and individual approaches and centered primarily on games, songs, and stories. We did not include a language training component, nor did we include any of the traditional non-reading skills such as colors, shapes, and sizes. We were concerned primarily with high-risk children, that is, those who come into kindergarten without extensive home experiences with print. We also decided that PRS would not be a full kindergarten program, but a supplementary program that focused narrowly on the skills most critical for learning to read. The pre-reading skills test would be used to screen children to ensure that those who already knew the skills would not be retaught them.

During the summer of 1971 a prototype of the program was developed and 10 field test sites were located in Wisconsin and Illinois. These sites ranged from rural northern Wisconsin to inner-city Chicago and included an equally wide range of teacher abilities and experiences. The Center support staff was heavily taxed for assistance in preparation of materials, field site liaison, and for evaluation. On the basis of the 1971–72 tryout, extensive revisions were made in the materials and a full inservice education program was developed.

During the 1972–73 school year, the program was field tested, with primary emphasis on the teaching-training procedures. Revisions were then made in both the program materials and teacher-training procedures, and a large-scale field test of two different approaches to teacher training was undertaken during the 1973–74 school year. The favorable outcomes of the 1972–73 field test and the initial success of the 1973–74 field test led the Center and the PRS staff to agree that the program was ready for commercial distribution. While the textbook pub-

lishers did not exactly break down the Center door in pursuit of rights to the program, mainly because it was a complicated kindergarten kit to produce and also required inservice training, one publisher, Encyclopaedia Britannica Educational Corporation, made a particularly attractive bid, and in time a contract for commercial production was signed.

With publication in the fall of 1974, the main work on PRS came to an end. Further efforts were directed toward a manual for teacher training, which was issued in 1977, a vocabulary segment for Spanish-speaking children, and a group-administered version of the Pre-Reading Skills Test. Further evaluations of the program were done by a number of people not associated with the project, showing highly positive results. The commercial edition was an exceedingly successful venture for EBEC, which continued to market the program for over 14 years. Only with their purchase by Encyclopaedia Britannica several years ago did they terminate manufacturing of the materials. The last kits were sold sometime in 1989, and so far as I can now determine, no further kits will be produced. Through 1989, over $275,000 in royalties were paid by EBEC to NIE and to the R&D Center from program sales. (The contract called for a 50-50 split of royalties between the two agencies through 1980.)

Through its history, the PRS project produced one commercial pre-reading skills program (PRS), a Spanish-language vocabulary supplement, a teacher-training manual, over 40 technical reports of which more than 40% were published as either journal articles or chapters in books, five Ph.D. dissertations, and three master's theses. Bob Calfee is still at Stanford where he continues to make significant contributions to reading and reading instruction; Robin Chapman is now a professor in the UW Department of Communicative Disorders; Ron Leslie is an Associate Professor in the Educational Psychology Department at New York University; Susan Pittelman lives in Milwaukee but continues to work part-time with the R & D Center on a mathematics project; and Marga Hirsch is head librarian at St. Francis Hospital in Wilmington, Delaware. PRS kits, even with worn and battered materials, continue to be used throughout the USA, and many of our tryout and field test teachers and graduate student assistants continue to communicate with one or another of us from locations around the country.

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Thomas A. Romberg

Sears-Roebuck Foundation–Bascom Professor in Education, Department of Curriculum and Instruction

University of Wisconsin-Madison

Thomas A. Romberg received his Ph.D. from Stanford University in 1967. From 1963 to 1966, he was Director of Stanford's Research and Test Development for the School Mathematics Study Group. He joined the faculty at the University of Wisconsin in 1966. Currently, he directs both the National Center for Research in Mathematical Sciences Education, funded by the U.S. Department of Education, and the Urban Mathematics Collaborative Documentation Project, funded by the Ford Foundation.

Professor Romberg is one of the leading mathematics education researchers in the world. He has served as chair of the Research Committee of the National Council of Teachers of Mathematics, the NCTM Commission on Standards for School Mathematics, and the Special Interest Group on Research in Mathematics Education of the American Educational Research Association. He is a member of the Mathematical Sciences Education Board of the National Academy of Sciences, the International Steering Committee of the International Group for the Psychology of Mathematics Education, and the Assessment and Evaluation Committee of the International Commission on Mathematics Instruction.

In 1989, he received the Research Review Award from AERA and the Distinguished Mathematics Educator Award from the Wisconsin Mathematics Council.

My interest in the content and structure of the mathematics curriculum, in how students are assessed, and in how educational research can be carried out, grew as a consequence of my involvement with the evaluation of the modern mathematics movement in the early 1960s. At that time, I became convinced that the abstract approach to mathematics then prevalent was wrong, particularly for young children. We had much to learn from developmental psychology and school sociology. Furthermore, standardized tests with their multiple-choice answer format failed to assess the most important aspects of mathematical performance. In particular, I was strongly influenced by George Polya with respect to what it meant to "do" mathematics.

My work since then has reflected these concerns. Fortunately, in 1966, I was invited to join the faculty of the UW-Madison to develop a graduate research program in mathematics education. My work with the graduate research program was supported from the beginning by the newly formed R & D Center. I have continued as a Faculty Associate in the Center since that date and have directed several research and development projects. The six most important of these have been:

The Analysis of Mathematics Instruction Project (1967–76). This project also involved Harold Fletcher, John Harvey, and later James Moser, and was funded by both the U.S. Office of Education and the National Science Foundation (NSF). Initially, we created several activity-based instructional units and conducted field-based instructional research. These included units on measurement, counting, addition and subtraction, and grouping and partitioning for young children. Their success led to the development of a complete K-6 curricular project—*Developing Mathematical Processes* (DMP) (Romberg, Harvey, Moser, & Montgomery, 1974, 1975, 1976). DMP was designed to be compatible with the individual instructional programming model of IGE and to be taught in a team setting as well as by individual teachers. A factor in the creation of this program was our recognition that existing mathematics curricula were not adequate in content coverage, content sequence, [illegible] approach, and materials for teachers and students.

Mathematics was developed in DMP by using a measurement approach. In a measurement approach, the children examine the objects in their world and focus on some attribute (for example, length, numerousness, weight, capacity, area, or time). They use various processes (describing, classifying, comparing, ordering, equalizing, joining, separating, grouping, and partitioning) to explore relationships between objects. Once they are familiar with each attribute, they symbolically represent (measure) it. Likewise, they symbolically represent the relationships between objects with mathematical sentences. In turn, they represent mathematical sentences with real objects to check their validity.

It is through these processes that children are first introduced to problems that they later will solve symbolically. Take, for example, the process of grouping. Susan, given a set of objects, is asked how many children she could give the objects to if she gave four to each. At first, Susan would solve this problem with the objects. Later, she would solve by dividing. This same process is used in DMP to develop place value when grouping by tens is to be learned.

The symbols have concrete or pictorial referents for children, and the operations are simply ways to describe what the children have been doing with the objects. Students often are asked to return to these concrete or pictorial referents as they validate an assertion.

A second mathematical emphasis in DMP is problem solving. Not only are problems presented for children to solve, but also a need for a new or a more efficient way to solve the problem is invoked. The DMP concept tries to overcome two stereotypes of mathematics problems: first, that there is always one correct answer, and second, that there is only one way to solve a given problem. To counter the "one correct answer" stereotype, DMP presents problems that have no answers and problems that have more than one answer. Children often are encouraged to solve problems in their own way. However, techniques and skills are presented to assist students in solving problems—it does children little good to know how to add if they do not know when to add.

Finally, DMP stresses self-reliance and self-assurance. From an early age, the children are asked to show why something is true (to validate). They may use concrete objects or pictures or, at times, may give a verbal explanation. They are not always dependent on authority to supply the final word about what they have done.

As with the introduction of arithmetical ideas, it is important for children to be introduced to geometric ideas in a concrete way. Geometry lends itself well to this approach, since there are so many examples and materials that can be drawn from the child's world. The geometry in DMP may be described as a "doing" geometry rather than as a "looking at" or "naming" geometry.

In a world filled with information, children need to learn to organize and interpret sets of information. Probability and statistics are a natural extension of the experiments in DMP and of data gathering.

These other branches not only provide motivation through variety but also give children opportunities to solve problems in different ways. For example, children in kindergarten may listen when trying to discover which solid object is in a closed box. "It can't be this one because it doesn't roll." "It can't be this one because it rolls straight." "It can't be this one because it would rock—glump, glump." Children arrive at the solution by the process of elimination—complicated, yes, but natural.

In summary, the mathematics of DMP is very natural to the child and prepares a child to attack and solve problems. In addition, DMP is a program in which the role of the teacher changes from one of lecturer to one of guide. One teacher expressed this attitude when she wrote: "The program gives the children the opportunity to learn rather than having the teacher tell them." This is truly a professional responsibility involving planning, knowing the children's abilities, interests, and needs, planning instruction accordingly, and encouraging children. The products of this project included a series of some 50 articles and reports and the DMP materials.

The IGE Evaluation Project (1975–79). I carried out this project with Gary Price, Thomas Popkewitz, Gary Wehlage, Robert Tabachnick, and Norman Webb, ably assisted by Ann Buchanan, Pam Klopp, and Debbie Stewart. This multifaceted effort involved the examination of the impact of IGE—its reading, prereading, and mathematics curricular materials—and of how the system was given meaning in schools. Approximately 30 reports and articles were produced from the project. Romberg (1985) presents a summary of four phases of the project. Phase I was a large sample study to provide basic information about IGE schooling. Phase II was designed to verify the self-report data gathered in Phase I as well as to extend the data collection to include more fully the range of variables that determine the processes of schooling. Phase III was a field study conducted in six schools, five of which had also participated in Phase I. Each of the six schools had been reported to be an exemplary IGE school by one or more IGE regional coordinators or researchers. Phase IV focused on the use and effectiveness of the three primary curricular projects developed at the Wisconsin R & D Center, the *Wisconsin Design for Reading Skill Development* (WDRSD), *Developing Mathematical Processes* (DMP), and the *Pre-Reading Skills Program* (PRS). Each program was developed to be compatible with the IGE system. The book summarizes the different evaluation phases, integrates and interprets the data from all of the phases, and draws implications for contemporary educational issues.

The Coordinated Studies in Mathematics Project (1978–82). I carried out this project with Thomas Carpenter and James Moser. It involved a longitudinal examination of the learning and teaching of addition and subtraction in grades 1-3. Some 30 articles and reports, a book (Carpenter, Moser & Romberg, 1982), and a monograph (Romberg & Collis, 1987) were produced. Also, from our work and that of others, Tom Carpenter and I wrote a chapter, Research on Teaching and Learning Mathematics: Two Disciplines of Scientific Inquiry, that received AERA's award for the best review of research published in 1986.

National Leadership Projects (1983–89). Driven by the criticisms of school mathematics in the early 1980s, I led or contributed to a series of projects at the national level. These included: School Mathematics: Options for the 1990s, New Goals for Mathematical Sciences Education, NAS Mathematical Sciences Education Board, NSF Monitoring of School Mathematics, and NCTM Commission on School Mathematics. These activities provided me with an opportunity to reflect

on the work of the past quarter century and, with others, to shape the direction of research and curriculum development in school mathematics for the next decade. These projects produced some 40 articles, book chapters, and other reports, the most important being *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989).

The Urban Mathematics Documentation Project (1985–92). Funded by the Ford Foundation, this project includes Norman Webb, Thomas Popkewitz, and Susan Pittelman. This study involves gathering information from school personnel in eleven urban cities and their involvement of secondary mathematics teachers in intellectual renewal and reform. To date, some 20 reports have been prepared and a book is now being organized.

National Center for Research in Mathematical Sciences Education (1987–90). I direct this Center, which also involves Thomas Carpenter and Elizabeth Fennema. It is funded by the U.S. Office of Educational Research and Improvement. Our work involves integrating research on learning with that on teaching, relating curricular reform to assessment, and conducting four coordinated studies on rational numbers, functions and graphs, teachers' beliefs, and the impact of technology on the mathematics curriculum. About 20 papers have been written (many more are in progress). One book has been published and several more books are now being prepared.

In summary, I view my involvement with WCER as central to my personal development as a scholar in mathematics education and to the development of the best graduate program in mathematics education in the country—a program recognized as one of the three or four best in the world. Having the intellectual and financial resources to build a staff, to recruit graduate students, and to attract interdisciplinary scholars to work on projects has been essential in this effort. Evidence of the quality of this work is reflected in the quality and productivity of our publications and in the quality of the graduates of this program.

It has not always been easy to carry on the research and development activities. In particular, there have been two sources of frustration. The first, and most prevalent, has been the lack of consistency and long-term support for educational R & D by federal agencies (Bureau of Research, NCERD, NIE, OERI, and NSF). For example, shifts in priorities in the early 1970s forced us to stop our research on instruction and develop a curricular program and materials. Then, as DMP was being completed, another shift in 1976 cut off implementation monies. Similarly, just as final information on our longitudinal studies on addition and subtraction was being gathered, funding for the analysis and write-up of the results was stopped. Each federal administration has approached educational R & D by starting over without considering on-going work. Added to these vagaries are the variations and inevitable reductions in funds with each new federal reshuffling.

The second frustration stems from the difficulties of getting the best R & D findings incorporated in school practice. In a recent paper (Romberg, 1988, pp. 224-225), I illustrated my frustration with two examples.

First, in the early 1970s when working with elementary schools that were adopting and helping define Individually Guided Education, I was surprised at the reaction of teachers, administrators, and publishers to the motivation research conducted at the Wisconsin R & D Center. Then, as now, many teachers complained about the need to motivate their students to learn, but they dismissed out of hand the well-researched motivation techniques dealing with goal-setting, tutoring, and so on. I found it difficult to understand the reactions of the teachers with whom I was working. In medicine when a new treatment is developed and shown to be effective, it is quickly and enthusiastically adopted. Why is that not the case in education?

Second, when studying the implementation of *Developing Mathematical Processes* I observed numerous teachers adapting activities that had been carefully developed. The adaptations were made for a variety of reasons. Often when interviewed, teachers justified the changes in terms of management (the class would be noisy), or in terms of the perceived ability of their students (I have the low group of students). In some cases, the changes that were made drastically altered the mathematical intent of the lesson. For example, a sequence of activities on measuring length was designed to have first-grade children measure a variety of objects in their room with arbitrary units such as pencils, cards, and links. Then the teacher was to conduct a discussion on the objectives of the topic, including the iteration process used to count the number of units, the fact that small units yielded a large number for the measure while large units yielded a small number, and that there is always some error when measuring that needs to be resolved. The discussion eventually was to lead children to seeing the need for a common unit. One teacher changed the activity so that instead of measuring real objects with arbitrary units that required iterating and counting, the children measured line segments on a work sheet with a ruler marked in inches. Furthermore, the line segments were drawn so that the measures were nearly exact. The teacher justified the changes in terms of her view of mathematics: It was wrong to give children the impression that a math problem could have several right answers, or that mathematics was ever imprecise. A lawyer who interpreted a law incorrectly would soon have few clients. Why is it assumed to be acceptable for teachers to modify and distort lessons so that the knowledge being transmitted is wrong?

These two examples illustrate teaching situations where, in my judgment, teachers failed to use research findings. In the first case, the teacher ignored research-based techniques that could improve practice; in the second, the teacher transmitted incorrect knowledge to students.

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Dorothy A. Frayer

Associate Academic Vice President

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Dottie Frayer received her B.A. in chemistry from Michigan State University in 1960. In 1962 she received her M.A. in counseling from Michigan State University specializing in Student Personnel Work in Higher Education. While studying for her master's she was an editorial assistant for the Review of Educational Research. *From 1962 through 1964 she was a freshman advisor at Miami of Ohio, combining the responsibilities of academic and resident advisor. She then spent two years as a guidance counselor at Lincoln-Way High School in New Lenox, Illinois. In 1966 she began doctoral studies at the University of Wisconsin-Madison with Dr. Herbert J. Klausmeier as her advisor. While pursuing the doctorate she was a research assistant at the Wisconsin Research and Development Center for Cognitive Learning. Her dissertation entailed the development of a "Schema for Testing Level of Concept Mastery" and marked the transition from studies using Bruner-like materials to subject matter concepts.*

After earning the Ph.D. in 1969, Frayer became a Research Associate and, later, an Assistant Scientist at the Wisconsin Center. She worked with Klausmeier to develop a research agenda to explore the effects of many variables on concept learning and supervised the collection of data for many of these studies. Frayer worked with principal investigators in language arts, science, social studies, and mathematics to identify concepts and test items for a factor analytic study of concepts. She also developed the initial tasks for a longitudinal study which tested children on Piagetian tasks and tasks related to Klausmeier's theory of concept learning and development. In addition, she guided much of the research on the system of Individually Guided Motivation (IGM) and led the production of five films for use in implementing IGM. As a result of her work she was a co-author of two books—Conceptual Learning and Development: A Cognitive View *and* Individually Guided Motivation. *A Distinguished Alumni Award was presented to Dr. Frayer by Michigan State University in 1970.*

In 1972 Frayer left the Center to become an Associate Professor of Educational Psychology at Hofstra University. One year later, she became Associate Dean of the School of Education at Hofstra. In 1976 she was appointed Executive Director of Grants, Contracts and Research Administration. In that position, she garnered funding for projects as diverse as "A Critical Biography of the Poet Stevie Smith" to "Teaching Cross-Cultural Values through the Visual Arts." With special expertise in education, grants were secured for Bilingual Education, Teacher Corps, Teacher Center, and Dean's Mainstreaming.

In 1981 Frayer became Dean of the School of Education at Duquesne University. Significant new programs included a collaborative program with the Pittsburgh Public Schools to train secondary teachers and a Center for Character Education. In January of 1989, Frayer became Associate Academic Vice President. Her responsibilities include development of new programs which are fundable and establishment of a Center for Teaching Excellence to enhance the teaching of full-time faculty, part-time faculty, and teaching assistants. Her research interests include metacognition among college students and teaching strategies to develop higher order thinking.

The origin of IGM coincided with the inception of the Wisconsin Center. During a period of approximately ten years (1965–75), IGM evolved through research, development, evaluation, and implementation, culminating in widespread utilization. In many respects, this project exemplified the vision of R & D centers, bringing together the talents of many to produce materials to solve an important educational problem.

During 1965–67 several Instructional and Research Units were established in elementary schools throughout the state of Wisconsin. These units, which were the forerunners of instructional units in the multiunit schools in the IGE system, were encouraged to carry out research to test the effectiveness of new educational approaches. These research studies were quite similar to what we would now call "action research"—studies carried out to determine the effects of a given teaching strategy within a particular classroom. Many of these studies focused on possible

solutions to motivational problems, since teachers saw motivation as the key to both learning and a good classroom environment.

An excellent example of such a research study was that carried out by Mae Elsdon at the third-grade level at Steven Bull School in Racine. Teachers were concerned that students showed little interest in independent reading. A program of weekly individual conferences with volunteer aides was instituted. Children were given concrete rewards (such as Batman pencils!) for reading a set amount of books. After nine months of implementation, the 72 children in the project read a total of 2,074 books. Reading achievement scores also showed significant gains.

Dramatic results such as these convinced Herb Klausmeier that the Wisconsin Center should systematically identify promising motivational procedures, carry out research to determine the critical aspects of these procedures, and develop inservice materials so that all teachers could implement them. Four procedures were identified for further exploration: (1) adult-child conferences to encourage independent reading; (2) teacher-child conferences to set goals in subject matter areas; (3) guiding older children as tutors; and (4) small-group conferences to encourage self-directed prosocial behavior.

As research was carried out on these four procedures, several motivational principles were incorporated into the guidelines for implementation: (1) focusing the child's attention on objectives, (2) providing models of desired behaviors, (3) helping the child to think through reasons for his/her behavior and consequences of different ways of behaving for himself/herself and others, (4) assisting the child in setting and attaining goals directly related to objectives, (5) providing feedback to the child, and (6) reinforcing the child's desired behaviors. An ingenious aspect of IGM was that it brought together important motivational principles with procedures that could be implemented in the classroom. Previously, teachers often came to the classroom with knowledge of motivational principles such as reinforcement, but found few occasions for reinforcing low-achieving or "problem" children. On the other hand, some teachers had a gift for motivating their students but did not have the means for sharing the critical aspects of their successful approaches with other teachers. IGM, however, wedded theory and practice.

During the period 1966–70, research studies were devised which operationally defined the four motivational procedures, employed experimental designs which enabled generalizability of results, determined effects of variations in the procedures, and assessed multiple outcomes. Studies were carried out by Barbara Kennedy, Richard Marliave, Elizabeth Schwenn Ghatala, Juanita Sorenson, James Bavry, Mary Quilling, Doris Cook, James Wardrop, John Gaa, Peter Lamal, and Carma Averhart. Herb Klausmeier and I provided direction and support for most of these studies. In addition to these research studies, the literature on modeling and on goal setting was critically reviewed to ascertain the most effective ways of employing these motivational principles.

The research yielded positive results and suggested modifications in the procedures. Based on the research, materials were prepared during 1969–71 to enable other teachers to use the four motivational procedures. For each procedure, a manual was prepared and a color film produced. The manuals gave practical guidelines for implementation and the films provided actual examples of the procedures, highlighting the motivational principles such as goal setting and reinforcement that were incorporated into the procedure. In addition, a fifth film was produced to provide an overview of IGM, and planning guides were published to suggest effective methods for inservice training. These pilot materials were prepared by many of the same people who had carried out the research, with the addition of Karen Holland, Kaye Rendfrey, and K. B. Smith.

The production of the films serves to emphasize an important point—each of the motivational practices originated in classrooms and all research was carried out in classrooms. This enabled us to produce films with realistic examples, using teachers and children who had already used the procedures. The only concessions to "show biz" were that teachers and children brought an extra change of clothes. After filming an initial conference, participants changed clothes (and sometimes places) and a follow-up conference was filmed, creating the illusion of the passage of a week's time between conferences. During the editing, actual conversations were interspersed with voiceovers and superimposed titles so that viewers would be aware of the important aspects to be noted.

Then came a critical point in the project. Could other teachers successfully implement these procedures based solely on the films and manuals? Field tests were designed for three of the procedures: (1) adult-child conferences to encourage independent reading; (2) teacher-child conferences to set goals in subject matter areas; and (3) small-group conferences to encourage self-directed prosocial behavior. The field tests, carried out from 1971 to 1973, involved from three to eight schools and tried out the procedures with children at various age/grade levels.

In these field tests, the "direct" target group was made up of teachers or conference leaders. Almost without exception, the teachers and leaders showed mastery of the knowledge and skills on which IGM is based. They perceived IGM as usable and effective and, in the case of goal-setting conferences, extended their use to other subject matter areas. The "indirect" targets in these field tests were the students. Here, too, positive results were noted. In the case of conferences to promote independent reading, the number of books read increased and positive changes in attitude and reading skills were observed. Goal-setting conferences resulted in a greater number of skills attained and this improvement persisted even after conferences were discontinued. Students participating in group conferences to promote self-directed prosocial behavior improved significantly on those behaviors discussed in conferences. Further, this improvement was maintained six to eleven weeks after conferences ended.

In 1972, a guide was written for students who would be acting as tutors. This made possible the field test of the tutoring procedure. Of greater significance was the fact that the Wisconsin Center could now make available to schools the entire IGM system. Teachers and, where appropriate, volunteer aides could learn about all of the motivational techniques and use each when appropriate. During the 1972–73 school year three schools implemented all four motivational procedures. Each of the three schools designated a coordinator who attended a two-day workshop to learn about IGM inservice programs and materials. Coordinators were primarily responsible for inservice and implementation. However, Wisconsin Center personnel assisted when necessary and Jan Jeter from the Center visited regularly to obtain informal feedback through comment cards and personal interviews.

As a result of this implementation of the complete system, materials were revised. The final set of materials consists of the five films; a textbook, *Individually Guided Motivation;* an illustrated manual for students and noncertified persons, *Tutoring Can Be Fun;* a manual for noncertified adults who conduct reading conferences, *A Guide for Adult-Child Reading Conferences; Inservice Implementation Manual for Individually Guided Motivation;* and *College Instructor's Guide for Individually Guided Motivation.* With the production of these materials any school can implement a system that has proven to be effective in improving learning and classroom behavior. In 1966 individual teachers achieved exciting increases in student motivation by experimenting with new techniques. In 1973 through the R & D process, these approaches had been refined, tested, and made available to any school that wished to implement them. In addition, the *College Instructor's Guide* made the IGM system available to teachers in training so they could enter the classroom with a clear idea of how to succeed in that almost mystical art of motivating students.

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Marvin J. Fruth

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Marvin J. Fruth, a former teacher, counselor, and school board member, received his Ph.D. from the University of Wisconsin where he has been a professor of educational administration since 1966. He has been department chair and presently teaches the introductory course in educational administration and supervises the administrator intern program. He has been involved in developing curriculum and training materials and working with urban and Native American school districts.

He was associated with the Wisconsin R & D Center from 1971 to 1981 where he was involved in the following: the MUS-E Staff Development Program, The Sears-Roebuck Foundation IGE Teacher Education Project, studies of the Implementation of Individualized Schooling, factors contributing to Effective Implementation of Individualized Schooling, and a study of Organizational Incentives and Teacher Responses to Student Diversity. He wrote several chapters on home-school-community relations in the Leadership Series in Individually Guided Education funded by The Sears-Roebuck Foundation and, with the late James M. Lipham, edited The Principal and Individually Guided Education.

In 1971 Herb Klausmeier asked me to join the R & D Center to work on the multiunit school staff development program. Specifically, I was responsible for conducting the workshops for IGE principals. As IGE evolved and as the principal improvement programs developed, we found a lack of systematic research and activities directed toward understanding and improving home-school-community relations, one of the seven components of IGE. So in 1973 I asked my colleague in the Department of Educational Administration, Professor B. Dean Bowles, to join me in conceptualizing, conducting research, and developing activities on home-school-community relations. Professor Bowles' research and teaching background in the politics of education and school community relations were exactly what we needed at that point in time.

We assumed that in order to create and maintain an optimal learning situation for students—a major goal of IGE—the students, staff, parents, and other citizens needed to understand their mutual expectations and available resources. In short, we needed to incorporate home-school-community relations into the IGE change process. In this pursuit we established three major goals. One was to

make the IGE school staff aware of and responsive to the educational expectations and available resources of the community, parents, and students. Another was to make the community, parents, and students aware of and responsive to the characteristics of the instructional program as implemented in IGE. The final goal was to identify and utilize ways and means of actively involving both staff and community in the awareness, commitment, changeover, refinement, and renewal phases of implementing IGE.

We developed a conceptual model that assumed eight underlying principles and included four major processes to be used by the key school personnel as they interacted with significant actors in the school community.

We first identified several underlying principles of home-school-community relations that we thought would be important in implementing an educational innovation such as IGE. The first principle stated that the benefits of IGE, or any significant educational change, must be visible and tangible to the various subpublics in the community. For example, they need to understand the benefits of IGE practices such as nongradedness, grouping patterns, and team teaching.

Second, in order to provide relevant instruction to children, we need to understand the environment in which the children spend the majority of their time. Consequently staff must work directly with parents. This can be done through volunteers in the classroom, home visits, parent participation in decisions affecting the life and learning of their children, or a host of other activities.

Third, when planning instruction, staff members must avail themselves of the educational resources of the community. This should result not only in greater learning for the students but also in creating greater awareness and understanding on the part of the staff.

Fourth, educators need to develop a more inclusive definition of community. Such a definition should include not only students, parents, and staff but the often-ignored nonparent citizens as well.

The fifth principle recognized that the most important subpublic is the students. They communicate their perceptions of the school to a wide variety of subpublics. They need to be viewed as ambassadors as well as the objects of instruction.

Sixth, schools need to adapt an active and preventive rather than a crisis-management orientation to their home-school-community relations. The lesson here is to build your relations in times of peace rather than in times of turmoil. It calls for ongoing, interactive, and meaningful relationships.

Seventh, educators do not hold a monopoly on the expertise on educational philosophy and practice. In most districts educators deal with well-informed, knowledgeable, and generally sophisticated publics.

Finally, we concluded that an effective home-school-community relations program is good, practical politics, not of the national, partisan variety, but of the variety which determines the kind of a community in which we will live, the kind of schools we will have, and the kind of educational program our schools will conduct. We defined home-school-community relations as the resolution of actual or potential conflict over the allocation of scarce resources (How much should we spend on teachers, paraprofessionals, or materials?), the choice of values (What is the relative value of cooperation vs. competition?), and the distribution of power (Who should be involved in shared decision making?).

To establish and maintain an effective home-school-community relations program for the implementation of IGE, four concepts and competencies were developed: analysis, communication, involvement, and resolution. All staff members require some degree of competency in each. Analysis involves identifying key educational issues and key subpublics or participants who are interested or vested in each. We helped to clarify this process and suggested ways for staff to improve their skills in analysis of their school community. Communication, the second concept, is a ubiquitous term that can be viewed from a myriad of perspectives. We examined modes, vehicles, styles and conditions of effective communications between the school and its subpublics with the objectives of clarifying and supporting the educational program.

Although communication is a form of involvement, we meant involvement to be the active participation of the several subpublics in various aspects of the school which were designed to improve instructional programming for the individual student. Involvement can include not only participation in planned and well-organized activities such as PTA meetings, back-to-school nights, or volunteer programs but also unplanned and spontaneous interactions between parents and staff, confrontations in which citizen groups control the agenda, unannounced visits or brainstorming sessions.

Analysis, communication, and involvement are aimed at resolving conflicts between the school, home, and community that affect instruction and ultimately the growth and development of individual students. We discussed four modes of conflict resolution identified by March and Simon in their classic book, *Organizations*. These modes included rational decision process, persuasion, bargaining, and power play. We attempted to describe conditions under which each mode is appropriate and helped staff to improve their competence in judging when to employ which mode.

In the model of home-school-community relations in IGE we also tried to identify the primary interaction patterns between school personnel at each level and their respective subpublics in the school community. (See Figure 4.1.) Those primary interactions were between the Superintendent/Systemwide Programming Committee and the school district community, the Principal/Instructional Improvement Committee and the attendance area community, the Unit Leader/Instructional and Research Unit and the home, and the individual teacher and the individual student. All of these primary interactions are aimed at optimal child

growth and development and utilized analysis, communication, involvement, and/or resolution.

Our major research involved a series of case studies of IGE schools in urban New Jersey, rural South Carolina, rural Wisconsin, and suburban California. In addition 11 doctoral students completed studies on school-community relations in IGE schools. Their experiences with the project helped to prepare them for significant educational administration roles across the country—John Ingram, William Klenke, and Roy Lake as principals; Lois Bartels, William Miles, and Richard Moser as superintendents; Marjorie Karges as a curriculum coordinator; Walter Krupa and Thornton Liechty as higher education administrators; Charlotte Oinonen as a federal program director; Hillel Raskas as a policy and planning consultant; and Jin Eun Kim as a professor.

In the final year we developed materials labelled Simformations for use by teachers and administrators in improving their home-school-community relations. These were on topics such as community analysis, grade reporting, parent conferences, use of volunteers, welcome wagon committees for new parents, home visits, and various activities to introduce parents to IGE concepts, practices,

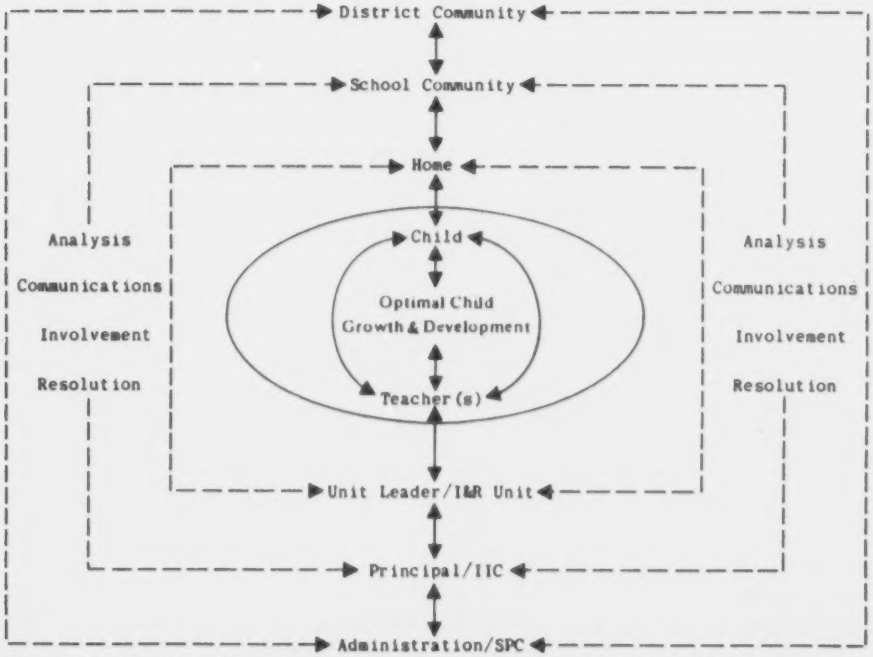

Figure 4.1. A model of home-school-community relations for IGE. (From M. J. Fruth, B. D. Bowles, and R. H. Moser, 1977, p. 265.)

and materials. Subsequently, some of the developers became involved in IGE materials development and The Sears-Roebuck Foundation IGE Teacher Education Project.

The most rewarding aspects of my work with the home-school-community relations project were the opportunities to examine a number of communities across the nation, to work with some very creative educators in the Center and in the schools, and to develop materials which helped bring the schools and their respective communities closer together. We had a significant impact on the schools. In part this was because we selected creative graduate assistants and worked with professional educators in the field who were dedicated to improving instruction. Also in part, it was because the Center provided us the resources and the independence to make these contributions.

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Thomas P. Carpenter

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University of Wisconsin-Madison

Tom Carpenter received his B.A. in Mathematics from Stanford University in 1962, his M.A. in Mathematics from San Diego State University in 1968, and his Ph.D. in Curriculum and Instruction from the University of Wisconsin. He taught mathematics for four years at a high school in East Palo Alto, California. Before coming to Wisconsin, he taught at Boston University and San Diego State University. Carpenter is a professor of Curriculum and Instruction, and he has had a concurrent appointment in the Wisconsin Center since 1976. He currently is Co-director of the National Center for Research in Mathematical Sciences Education and is the prin-

cipal investigator on a project studying mathematics instruction for the primary grades. These projects are funded through the Center by the Office of Educational Research and Improvement of the U.S. Department of Education and by the National Science Foundation, respectively. Carpenter is editor of the Journal for Research in Mathematics Education.

The Cognitively Guided Instruction project is based on a chain of Center research that dates back over ten years. In the initial work, Thomas Romberg, James Moser, and I studied how early number concepts develop in young children. The project included a three-year longitudinal study tracing the development of basic addition and subtraction concepts in children (Carpenter & Moser, 1984). The work demonstrated that children enter school with rich informal knowledge about mathematics that could provide the basis for developing understanding of basic mathematical concepts and skills. The research resulted in a taxonomy of problem types that provided a framework for understanding the processes that children use to solve different types of problems. Major levels of acquisition of conceptual and procedural knowledge were identified, and models that describe the underlying knowledge structures were proposed (Carpenter & Moser, 1984).

Elizabeth Fennema, Penelope Peterson, and I have just completed a four-year project that investigated how this work on children's thinking may be applied to improve instruction in mathematics. Specifically, we studied how teachers may use the knowledge gained from this research to help children connect the formal symbols and procedures they learn in school to these rich informal systems of mathematics. Rather than attempting to prescribe a program of instruction based on this research, we studied how teachers use the knowledge we had acquired about children's thinking to make instructional decisions. This approach, which we call "Cognitively Guided Instruction," is based on the premise that the teaching-learning process is too complex to specify in advance. Instruction necessarily needs to be mediated by teachers' decisions, and ultimately the most significant changes in instruction will occur by helping teachers to make more informed decisions rather than attempting to program them to perform in a particular way.

The guiding principle for Cognitively Guided Instruction is that instructional decisions should be based upon careful analyses of children's knowledge and the goals of instruction. This requires that teachers have a thorough knowledge of the content domain and that they can effectively assess their students' knowledge in this domain. Knowledge of the content domain is not limited to a purely mathematical analysis; it also includes an understanding of distinctions between problems that are reflected in children's solutions at different stages in acquiring expertise in the domain. This includes knowledge of problem difficulty as well as knowledge of distinctions between problems that result in different processes of solution. The ability to assess their own students' knowledge also requires that teachers have an understanding of the general

stages that children pass through in acquiring the concepts and procedures in the domain, the processes that children use to solve different problems at each stage, and the nature of the knowledge that underlies these processes.

We have found that most teachers can identify many of the critical distinctions between problems and the primary strategies that children use to solve different problems, but this knowledge is not well organized into a coherent framework that relates distinctions among problems, children's solutions, and problem difficulty to one another. We also have found that teachers' knowledge of their own students' problem solving abilities is related to students' achievement (Carpenter, Fennema, Peterson, & Carey, 1988). There also are significant relationships between the belief that it is important to understand and build upon children's thinking and students' achievement (Peterson, Fennema, Carpenter, & Loef, 1989).

The major thrust of the project has been to study the effect of helping teachers to understand the outcomes of research on children's thinking. Rather than specifying a program of instruction based on principles derived from the research, we used the research to help teachers understand their own students' thinking and allowed them to make the critical instructional decisions based upon this knowledge. We have found that knowledge of this research has a significant influence on teachers' beliefs, their classroom instruction, their knowledge of their students, and their students' achievement. A workshop designed to help teachers use our research on children's thinking to understand their own students resulted in teachers more often encouraging students to use a variety of problem solving strategies and listening to the processes their students used to solve problems. The teachers' beliefs changed, and they knew more about individual students' problem-solving processes. These changes in teachers' beliefs, knowledge, and classroom practices were reflected in significant changes in students' problem solving achievement, reported understanding, and reported confidence in problem solving.

Elizabeth Fennema and I are continuing to study the effects of helping teachers understand and build upon their students' thinking. In the initial project we focused on a single content strand in a single grade. In spite of our limited focus, we observed that the greatest changes in both teachers and students were cumulative and occurred over an extended period of time. We are just beginning a five-year project to study the longitudinal effects of a broadly based Cognitively Guided Instruction program on teachers and students. This chain of inquiry also has provided the focus for the Teaching/Learning program of the National Center for Research in Mathematical Sciences Education, which has been a part of the Wisconsin Center for the last three years.

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Peterson, P. L., Fennema, E., Carpenter, T. C., & Loef, M. (1989). Teachers' pedagogical content beliefs in mathematics. *Cognition and Instruction, 6*(1), 1-40.

Romberg, T. A., & Carpenter, T. P. (1986). Research on teaching and learning mathematics: Two disciplines of scientific inquiry. In M. Wittrock (Ed.), *The third handbook of research on teaching* (pp. 850-873). New York: Macmillan.

The Upper Great Lakes Multifunctional Resource Center, headed by Professor Walter Secada, reflects one of several new directions of the Wisconsin Center for Education Research in the post-1985 era. Rather than developing educational products and conducting related research, this WCER Center provides technical assistance to educators and schools involved in educating students of limited English proficiency.

5 Experiences of Former Graduate Students

How did graduate students participate in making the Center's history? Mainly as neophyte researchers. Professors who were affiliated with the Center were administratively responsible for their project activities. However, graduate students assigned to the projects as research or project assistants carried out a great deal of the research. The student typically completed a master's thesis or a doctoral dissertation as an integral part of the project research. The overwhelming majority of graduate students and professors experienced many satisfactions in this relationship. They engaged in most stimulating intellectual activities in their project work sessions and in the professors' seminars. They advanced the state of the art relative to the project field of interest and gained massive amounts of new information from one another. Cross-fertilization in meetings with other research teams was especially enriching.

The authorship of the several hundred technical reports of the Center shows that graduate students conducted a great deal of the Center's project research. Many students published an article or two based on their Center studies. They and others incorporated the findings from these studies in other articles, book chapters, and books. For the large majority of students who subsequently became university professors, the doctoral dissertation marked the beginning rather than the end of their research publications.

I selected the former graduate students to be representative of the 557 who were employed by the Center for an academic year or longer, are currently located in different states and countries, who were at the Center at different times from 1964 to 1989, and who entered different kinds of careers. Some are in the early years of their professional careers while others are matured professionals. I invited them to highlight their experiences while at the Center and to indicate how the experiences might be related to their present careers. The invitation suggested that they might cite three to five publications that reflected interests that continued from their Center work.

The contributions of the 557 former students to the Center's productivity and their current impact on education are difficult to imagine. I should emphasize that I selected the 10 former students to be representative of the total group, not only widely recognized ones, such as, for example, Professors Carpenter (chapter 4), Frayer (chapter 4), and Porter (chapter 6).

Angela M. Brasil Biaggio

Professor of Educational Psychology and

Director of the Psychological Center,

Federal University of Rio Grande

do Sul, Porto Alegre, Brazil

Professor Angela Biaggio was a research assistant at the Wisconsin Center in 1964–65. In addition to her present work as a Professor of Educational Psychology, she is a senior researcher for the Brazilian National Research Council, President-elect of the Interamerican Society of Psychology, and a consultant to the Brazilian National Research Council and the Brazilian Ministry of Education.

I worked as a research assistant at the Wisconsin Center for Education Research, then called the R & D Center, during the 1964–65 academic year while I was a master's student. I collaborated in the studies on concept attainment led by Professor H. Klausmeier and learned a great deal about learning theories and educational psychology, together with advanced doctoral students such as Bill Goodwin and fellow master's students such as John K. Samelian.

I have memories of hard work and study as well as pleasant sharing of experiences and coffee with fellow students and staff, including Peg Perry. I remember walking up University Avenue from Bascom Hill or State Street in heavy snowstorms all the way to building number 2006, the old windowless supermarket that then housed the Wisconsin Center, a building quite different from the modern well-equipped facility on West Johnson Street that I visited in 1986. Then spring came, and John Samelian and I were busy trying to locate some culturally deprived families for Professor Arthur Staats who would join the Center in

the summer of 1965. Staats spent the summer in Madison but found very few culturally deprived children. (The term *culturally deprived* was in wide use in the mid-sixties but is, of course, inappropriate today.)

This was the time for concern with poverty, Blacks, early stimulation, and the Head Start program. We edited a *Culturally Disadvantaged Newsletter*. I remember writing a review of J. McVicker Hunt's book *Intelligence and Experience* for the *Newsletter*. My own M.A. thesis had to do with the relative predictability of SAT scores in Black and White southern colleges, under the advisement of Professor Julian C. Stanley. The thesis was published as a Technical Report of the Center.

In 1965 I entered the Ph.D. program. As a Brazilian student I had been awarded a fellowship from the Organization of American States and gave up my research assistantship at the Center, in spite of Professor Klausmeier's generous offer for me to stay on. I worked on my Ph.D. with Professor Robert Grinder and did my dissertation on the topic of moral development. I finished in 1967, but in the long run I regretted having chosen the OAS fellowship over the assistantship at the Center. The fellowship helped me finish quickly, but I missed the learning experiences and the comradeship at the Center. The two years of doctoral work were sort of lonely.

I pursued an academic career, having taught at Moorhead State University, Minnesota, and at four major Brazilian universities: Pontifical Catholic Universities of Rio de Janeiro and Rio Grande do Sul, University of Brasilia, and Federal University of Rio Grande do Sul. I feel that I have made a contribution to the fields of psychology and education in Brazil, helping establish graduate programs in these universities, and being a member of the first Council of Representatives and the National Association for Graduate Study and Research in Psychology, and a member of the first Regional Council of Psychology in Brazil.

I have been teaching, doing research, supervising students in research activities, theses and dissertations all these years. Most of my research has been in the field of moral judgment and on anxiety. I have published over fifty articles in U.S., Brazilian, and international journals, as well as having served as an editorial consultant to international and Brazilian journals. I have kept contact with U.S. psychology as a member of APA since 1969, and I have participated in AERA and APA conventions. I have also been active in international organizations such as ISSBD, ICP, and the Interamerican Society of Psychology, having served on its Board of Directors since 1974 and having recently been elected President.

The focus on *research* of high standards in terms of theoretical foundations, methodological rigor, and practical application to education has probably been the main lesson I learned at the Wisconsin Center, and I hope I have helped to stimulate it in my own country. Twenty-five years after my stay at the R & D Center I still feel the influence of the high level of academic work and cordial atmosphere I found there. These have certainly been an inspiration in my career, and I am very grateful to all who made this experience possible.

Selected Publications

Biaggio, A. (1975, 1988). *Psicologia do Desenvolvimento.* Petropolis, Rio de Janeiro: Editora Vozes. (A developmental psychology textbook in the Portuguese language, now in its 9th edition.)

Biaggio, A. (1979). Relationships between maternal and peer attitudes, and maturity of moral judgment in Brazilian boys. *Journal of Genetic Psychology, 13,* 203-208.

Biaggio, A., & Rodrigues, A. (1971). Behavioral compliance and devaluation of the forbidden object as a function of probability of detection and severity of threat. *Developmental Psychology, 4,* 320-323.

Biaggio, A., Simpson, S., & Wegner, G. (1973). A developmental study of cognitive dissonance as a function of level of maturity in Piagetian tasks. *Genetic Psychology Monographs, 88,* 173-200.

Biaggio, A., & Spada, M. (1982). Relationships between maturity of moral judgment and structure of personality: A test of Hogan's hypothesis with Brazilian subjects. *Interamerican Journal of Psychology, 16*(1), 21-25.

Leslie P. Steffe

Research Professor, Department of Mathematics Education

University of Georgia

Leslie Steffe was a research assistant at the Wisconsin Center from 1964 to 1967. He then took a position at the University of Georgia and served as Assistant Professor, Associate Professor, and Research Professor of Mathematics Education, his present position. In 1983 he was awarded the Creative Research Medal by the University of Georgia Research Foundation and in 1984 the Albert Christ-Janer award for Creativity in Research.

I joined the Wisconsin Research and Development Center for Cognitive Learning in the fall of 1964 on the invitation of Professor Henry Van Engen. The mathematics education group had two primary missions: to develop *Patterns in Arithmetic,* a mathematics program for the elementary school designed for educational television, and to do research that would contribute to this development effort. Curriculum and theory development were to mutually overlap, each providing problems and insights for the other. I worked closely with Professor Van Engen in this research and development effort and had the privilege of becoming deeply immersed in the thinking of one of the best minds in the field. As a

result, it was possible to experience the problems that are involved in coordinating research and development in an intensive way.

One of the basic features of our work was its interdisciplinary nature. The very fabric of our effort was woven from interdisciplinary conceptual threads, several of which had their origin in the constructivism of Jean Piaget. In my recollection, our commitments of the day were not shared by very many other investigators in the Center, and intellectual disputes arose that in part had their origin in our epistemological assumptions. These disputations turned out to be crucial in my graduate education and contributed to my growth as a professional educator in ways that I could not then foresee.

A second basic feature of our work was the presence of visiting scholars such as Myron Rosskopf, then Professor of Mathematics Education at Teachers College, Columbia University, and Kenneth Lovell, then Professor of Educational Psychology at the University of Leeds, England. There were also frequent guest speakers and other Center visitors, all of whom kept the intellectual climate at the highest level.

I view my tenure at the Center as "the good old days," in part because the seeds of my past and current activities were planted during that time. I can now see how the nature of our activities, if not the activities themselves, would be even more relevant today than they were then. Our epistemological assumptions and their consequences predated some of the sweeping changes in the field of mathematics education that have occurred over the past ten years. I do not claim that the "early" activities caused these changes, simply because there are too many intervening forces to attribute causality to any one of them. But I do claim that they have continually influenced the nature of my professional activities.

The Georgia Center for the Study of Learning and Teaching Mathematics, a consortium of investigators that I organized in 1975, predated other current organizations in mathematics education and can be traced directly to my formative years at the University of Wisconsin. Various other projects that I have directed or have been involved in as a principal investigator also have their roots in my graduate education. The project Interdisciplinary Research on Number is a reformulation of my interest in children's mathematical thinking that began at the Wisconsin Center. In fact, the project can be viewed as an outgrowth of our failure to articulate research and development. These failures led me to forego curriculum development and to concentrate on child studies in an attempt to formulate viable models of children's mathematical concepts and operations. At the time, I felt that much of our developmental effort was based on how we adults understood mathematics rather than on how we adults understood children's mathematics. It seemed unreasonable to me then that mathematics educators should be forced to rely almost solely on research in epistemology, psychology, or philosophy to inform them about the mathematics education of children. And it still seems unreasonable to me. At a most basic and fundamental level, my goals have included developing a mathematics of children beyond what I read in books written by

people in allied fields. These goals are the most important thing that came out of my work at the Wisconsin Center.

Selected Publications

Steffe, L. P., & Cobb, P., with E. von Glasersfeld. (1988). *Construction of arithmetical meanings and strategies*. New York: Springer Verlag.

Steffe, L. P., von Glasersfeld, E., Richards, J., & Cobb, P. (1983). *Children's counting types: Philosophy, theory, and application*. New York: Praeger Scientific.

Steffe, L. P., & Wood, T. (1989). *Transforming children's mathematics education: An international perspective*. Hillsdale, NJ: Erlbaum.

Russell L. Carey

Educational Consultant

Iowa Department of Education

Russell Carey, like many others who became interested in educational research, began his career as a teacher. He taught science and mathematics in North Dakota from 1958 to 1961 and science in South Dakota from 1962 to 1964. He joined the Wisconsin Center in 1965 as a research assistant. Three years later he joined the faculty of the University of Georgia where he remained until 1972. He then moved to the Iowa Department of Education in 1972 where he serves as an Educational Consultant.

My introduction to the Wisconsin Research and Development Center for Cognitive Learning in the spring of 1965 consisted of attending a meeting for members of a Science Supervisors Institute in a building previously used as a grocery store. Privacy was limited with the less than adequate office dividers. The lighting was poor and the acoustics were more suited for a sporting event than serious thought. I asked myself, "Could this place be a research and development center?" I now cherish the experiences in my introduction to a new Research and Development Center in its first year of operation. The introduction taught this graduate student the valuable lesson that creative, intellectual, and scholarly ideas can be born, nurtured, and grown to maturity in less than ideal material environments. My unimportant perceptions of a materialistic environment were originally masking important perceptions of an intellectual environment. Since my historic 1965 introduction to the Wisconsin R & D Center I have a limited tolerance for educators who use a less than "show case" materialistic environment as an excuse for not exercising intellectual behaviors.

When the R & D Center moved to the Regent in 1967, I continued as a staff member of the Science Concept Learning Project with Milton O. Pella and George T. O'Hearn as principal investigators. Central to the project were the development and implementation of instructional strategies to teach concepts from several different conceptual schemes to young children. Life as a Center staff member was intellectually exciting. Frequent scholarly interactions and informal dissemination sessions with members of other projects were an education in themselves. We knew the team that was working with the schools in starting the Research and Instruction Units (later IGE) and what they were attempting to accomplish. We were interested in the intentions and successes of the math, English, and educational psychology projects. Experts with special knowledge in areas such as psychological theories, research methodologies, statistics, and test construction were available for consultation and sometimes were assigned to specific projects. The learning opportunities were tremendous for an individual like me whose previous educational experiences had been limited to science disciplines. Herb Klausmeier was very successful in fostering cooperation and motivating staff members. We were "family" in educational research and development activities.

I learned in the Wisconsin R & D Center a number of valuable ideas that are not common to all created educational environments and societies. First, it is the idea that is created and its credibility that are important rather than the status of the creator. People in the R & D Center, regardless of their status, were respected for their intellectual contribution. Second, statistics is a research tool in contrast to being research. If there are not any intellectual creations, there is little need for statistics in an acceptance or rejection decision process. Third, the dissemination of information is an important activity. Sharing information is not an "ego trip" by any means. Fourth, problem identification and asking the "right" questions are very important. Fifth, everyone in education needs to know theories and results from psychological research. The sixth and last idea I will mention is mainly for graduate students. If you have limited writing skills, always sit on the waste paper basket when presenting written materials to your major professor. The reason should be obvious.

I am proud to be an educationally molded product of the Wisconsin R & D Center for Cognitive Learning. Over the years, I have often thought the "hidden curriculum" for doctoral students was superior to the planned curriculum in many institutions.

Elizabeth Schwenn Ghatala

Professor of Educational Psychology

University of Houston

Liz Ghatala was first a project assistant at the Wisconsin Center and, after being awarded the Ph.D., an Assistant Scientist (1971–72). She then became a research psychologist at Weber State College (1972–76) where, partially funded by the R & D Center, she continued research on children's cognitive learning. She joined the Educational Psychology Department at the University of Houston as an Associate Professor in 1976 and became a full Professor in 1981. She received the Outstanding Young Educational Researcher Award from the Spencer Foundation in 1974 and was elected Fellow of the American Psychological Association in 1977.

I began work as a project assistant at the R & D Center in the fall of 1967 after finishing a master's degree in experimental psychology at Northwestern University. Up to that time, my experience in psychology had been pretty much limited to laboratory investigations in verbal learning directed by Ben Underwood. Thus, the emphasis on applied research in school settings at the Center was quite new and refreshing to me. I began working on the Center's model of motivation (Individually Guided Motivation) under Herb Klausmeier's direction. The next year I began doctoral studies in Educational Psychology.

The Center was an exciting place to be. There was a sense of pioneering in areas that would really make a difference in schools and in children's lives. I believe that the leadership of Herb Klausmeier had much to do with the dedicated spirit at the Center. He put his heart and mind into bringing about innovative changes in education, and his spirit was catching.

In addition to IGM, I also worked with Herb and other graduate students, most notably Dorothy Frayer, on developing the Center's model of concept learning (Klausmeier, Ghatala, & Frayer, 1974). The discussions (arguments?) we had concerning the processes involved in learning concepts at different ages spurred my interest in developmental issues that has informed my work ever since.

After receiving my doctorate I stayed on for a year at the Center as a research scientist. During that year, I started doing research on imagery and verbal processes in children's discrimination learning with Joel Levin, a new faculty member at the Center. The collaboration with Joel spanned the next 15 years and resulted in nearly 60 articles on children's learning, memory, and metacognition.

One of the primary outcomes of the work has been knowledge that we could share with teachers concerning the kinds of learning strategies that will help children on various academic tasks and how to teach strategies in such a way that children become self-regulated learners (see Ghatala & Levin, 1976; Ghatala, 1984; Pressley & Ghatala, in press).

In addition to influencing the direction of my research, being at the Center brought me in contact with people such as Herb Klausmeier, Joel Levin, and Mike Pressley, who have become lifelong friends and colleagues. My life has been greatly enriched by them.

Selected Publications

Ghatala, E. S. (1986). Strategy-monitoring training enables young learners to select effective strategies. *Educational Psychologist, 21,* 43-54.

Ghatala, E. S., & Levin, J. R. (1976). Children's recognition memory processes. In J. R. Levin & V. L. Allen (Eds.), *Cognitive learning in children: Theories and strategies.* New York: Academic Press.

Klausmeier, H. J., Ghatala, E. S., & Frayer, D. (1974). *Conceptual learning and development: A cognitive view.* New York: Academic Press.

Pressley, M., & Ghatala, E. S. (in press). Self-regulated learning: Monitoring learning from text. *Educational Psychologist.*

Arie Cohen

Professor, School of Education

Bar-Ilan University, Ramat Gan, Israel

Professor Arie Cohen was a research assistant at the Wisconsin Center for Education Research, 1971–73. From 1973 to 1979 he was at the Eagleville Hospital, Pennsylvania, serving as associate and co-director of a large research project. He then went to Bar-Ilan University, Israel, as a Professor of Education.

I arrived in Wisconsin in 1971 as a foreign student for the Ph.D. program at UW, lonely, in a different culture and weather conditions, with serious doubts in my heart and only small savings in my pocket. Then I was able to find employment as a data analyst at what we used to call the R & D Center, and my future perspectives changed completely. I worked with Dick Venezky as my mentor and supervisor on the Pre-Reading Skills Project and gained knowledge and experience in read-

ing and in research. At the Center I met Frank Farley, and our association has led to fruitful collaboration and long lasting friendship. The financial support that I received from the Center enabled me to complete my Ph.D. studies in two years, and the experience enabled me to obtain a position as Associate Project Director on a large-scale federal research grant immediately after graduation.

In retrospect I would say that my experience at the Center played a major part in my decision to dedicate my career to research.

Selected Publications

Cohen, A. (1973). Smallest space analysis of the Revised Illinois Test of Psycholinguistic Abilities. *Psychology in the Schools, 10,* 107-110.

Cohen, A. (1974). Scale interdependency effect and the smallest space analysis of structure. *Psychological Bulletin, 81,* 766-772.

Cohen, A. (1987). Validity and reliability of a questionnaire for measuring level of democracy in high school. *Megamot* (in Hebrew), *30,* 316-329.

Cohen, A. (1989). The effects of achievement in reading on the self-esteem of underprivileged adolescents in the military. *Megamot* (in Hebrew), *32,* 75-83.

Lee F. Olsen

Superintendent

Bellingham (WA) Public Schools

Lee F. Olsen received a B.S. degree at Carroll College (WI), master's at the University of New Mexico, and Ph.D. from the University of Wisconsin-Madison. For two decades he has served as a superintendent in four states in school districts ranging in size from 400 to over 10,000 students.

I became aware of the Wisconsin R & D Center in August of 1969 when I was a project assistant with the National Educational Finance Project. Dr. Richard Rossmiller directed the study that investigated *Fiscal Capacity and Educational Finance* and *Educational Programs for Exceptional Children.* In 1973 I returned to the R & D Center on a project to identify and study educational components that make for an effective teacher in the classroom. These experiences provided a framework for my administration of schools for twenty years. The opportunities to visit and work with professors of various talents at the R & D Center taught me organization, patience, and understanding. Probably the most important outcome was the concept of people working together, collaboration for a common cause, for the improvement of education.

The Center provided for transition, transition from the superintendency to the University and then back to the superintendency. I have been involved in a number of superintendency transitions over my career. Positive relationships, open communication and effective management are all characteristics of my current position. I am fortunate to have developed and/or recruited staff who are self-actualizing, enjoy freedom, are cooperative and collegial, and are committed to service. Does this sound similar to my experiences at the R & D Center? The answer is "Yes."

In Bellingham, I have worked closely with the Sehome High School principal and staff to plan for educating students who will graduate in the 21st century. Through this process, we have developed a local planning committee entitled the "1990s Committee." Sehome was one of twenty-seven schools nationally that received the Association for Supervision and Curriculum Development (ASCD) award for the "Futures consortium." In 1988 Sehome and the district were selected to be one of Washington state's 21 schools involved in "Schools for the 21st Century." This is an exciting part of my job, planning for the future. Our vision is personalizing the high school for students, staff, and parents and making it a learning community. This seems to me reminiscent of the R & D Center thrusts of the late 1960s and 1970s.

We are also committed to an effective gifted and talented program. My experience in this area goes back to my work on the National Educational Finance Project. We are working with our teaching staff to develop a curriculum that can be utilized in teaching able students as well as all students. The curriculum will have an impact on all subject areas. We have achieved much so far:

1. Clarified district-wide long-range goals for the gifted program.
2. Wrote annual detailed procedural plans for clarifying, improving, and expanding the gifted program in the areas of (a) identification, (b) staff development, and (c) evaluation.
3. Established task forces as necessary to accomplish the objectives and tasks delineated in the written plans.
4. Developed a scope and sequence.
5. Redesigned and implemented evaluation of selected aspects of the program.

The R & D Center provided the environment for an individual to develop leadership skills. One program that I'm particularly pleased with is our substance abuse prevention program. I have provided leadership in the area of drug and alcohol education and intervention. The programs that we have implemented have shown results. There are many components that combine to make the program successful, such as core teams in each school, the addition of intervention and prevention specialists who are certified drug/alcohol counselors, support groups,

parent workshops, staff training, community coordination, and a comprehensive discipline policy. The most recent program introduced in the district is DARE (Drug Abuse Resistance Education) for fifth graders, run in conjunction with the police department. Our program has been recognized as a leader in our community and the state.

Looking back over twenty years, I can say that I was fortunate to have the opportunity to work at the Wisconsin R & D Center. Not only was the staff outstanding but also other project assistants were very supportive. The experiences have indeed provided an operational framework for my administration of schools.

David Pimm

Faculty of Mathematics

The Open University,

Milton Keynes, England

Between the autumn of 1977 and the summer of 1979, I was enrolled in the doctoral programme (I am British and still put extra *u*s in words such as humour, too) in mathematics education at Madison. As part of my nutritional lifeline, I worked as a research assistant part time with Tom Romberg, Tom Carpenter, and Jim Moser on the fifth floor of the West Johnson Street edifice, sharing an office with Connie Martin, a fellow graduate student. My duties, as I recall them, varied (I was also a teaching assistant in the mathematics department for that period), but were mainly of a literary character. When Tom Romberg was around he would generally call me in to talk, frequently suggesting that I subsequently look at something. Among those tasks, I remember that one involved carrying out an extensive literature search for work on the linguistic aspects of verbal arithmetic problems as part of a major project on the teaching of addition and (particularly) subtraction. This was a preoccupation of a number of members of the math education group at the time. I also translated a document by Willy Servais from the French and worked on a review of a book on probabilistic thinking by Ephraim Fischbein.

Also, on occasion, a group of us would adjourn into the library back room on the math education level and watch videotapes of interviews with pupils. Despite my four years in the U.S., I never managed the mental leap required to see a kindergartner as a student, someone who for me comes equipped with a college scarf and a bank overdraft. Our endeavour was to get some relatively consistent codings and judgments about what the pupils may or may not have been doing to solve word problems. I was fascinated by the range of productive wriggling, tap-

ping, and other manifestations of body mathematics that were in evidence in these children.

My strongest memories of the Centre are less of an institution or a physical place than of a group of people, students and staff, talking and working together, attempting (often successfully) to merge the work of apprenticing, researching, teaching, and earning a living. The Centre had an interesting status from my perspective, being separate from and yet seeming an integral part of the University. The most important skill I acquired during that period is one of pulling apart (more in the sense of finding out how something works than yanking legs off flies) whatever was the focus of our individual or collective attention. Work was an important and recognized composite of the individuals who contributed to it. I also benefited from cross-fertilisation with adjacent (and sometimes not so neighbourly) disciplines. I had 'had' far too much statistics and psychology prior to my arrival on the isthmus, so I found a major 'minor' in History of Science. I also particularly recall enlightening conversations with Jan (Greenstein) Jipson and Gary Price.

Being presented with an irresistible employment offer, I went back to England in the summer of 1979 to work first with Richard Skemp on a primary mathematics project at the University of Warwick for two years and then with Hugh Burkhardt and Alan Bell at the University of Nottingham Shell Centre for Mathematical Education. In January 1983, I took up my present position as Lecturer in Mathematics Education in the Mathematics Faculty of the Open University. The OU is an adult distance teaching institution offering a full range of undergraduate and some graduate courses to some 100,000 students nationally, involving a range of media including television, radio, computer software, and videodisc, as well as more familiar printed texts. My main involvement has been with courses in Mathematics Education and the History of Mathematics.

The aspect of my work that has continued and developed from my Madison time is an interest in mathematical language and classroom discourse, which culminated in the publication of the book *Speaking Mathematically: Communication in Mathematics Classrooms* (Routledge & Kegan Paul, 1987). It was a book a long time in the writing: the saying that there is at least one book inside everyone looked like an integer approximation and in my case it seemed to have been 0.94 of a book for the longest time. But after some six years in the construction, it finally saw light of day. Despite bracing a number of friends to wrestle me to the ground should it even look like I was contemplating starting work on another, I am working on a second, tentatively entitled *Signs of the Times: Metaphor and Metonymy in Mathematical Discourse.* (A strong memory from my time in Wisconsin was science historian David Lindberg saying, "There are many published books I'm glad I haven't written; there are only a few I wish I had.")

I end this short reminiscence with an anecdote about my arrival in Madison. On my drive out from Cornell, I had all my belongings crammed into a rental car, my permission to stay in the country (via Fullbright) had expired, and I

had no apartment to go to. It was a lovely day, and I made the mistake of being somewhat cavalier with the posted 55 mph speed limit. Soon I had a member of the state constabulary on my tail. He asked a series of what I'm sure seemed to him to be reasonable and standard questions. Where was I from, where was I going, could he see my driving license (English and buried somewhere in four tons of ancillary paper in the boot), car title, insurance, passport, . . . ? With every subsequent response, it became apparent that I was the most temporary and ephemeral person he had ever seen, barely able to claim existence, let alone anything he could check. With evident relief on both sides, he let me off with a caution, allowing me to arrive in Madison in time to take up my position on West Johnson Street.

When I left Wisconsin two years later, I did not have that feeling of transience—I had been at a place where I had belonged, albeit in a slightly exotic, non-standard fashion; where I had been accorded scope, leeway, and trust; and where efforts had been made to find tasks that would be productive for me to do and not just things that needed doing. I still see the Toms Romberg and Carpenter at international meetings and occasionally conversation turns to our former encounters. They, the Center, and I have all moved on in many respects in the last ten years, but there is still something in common that we carry with us from then.

Ann Albuyeh
Associate Professor and
Graduate Program Director,
Department of English,
University of Puerto Rico

Before entering graduate school, Ann Albuyeh taught English and worked as a reporter and free-lance writer in Iran. While a doctoral student in English Linguistics she served as a research assistant at the Wisconsin Center for Education Research from 1981 to 1983 and also taught for both the English Department and Integrated Liberal Studies Program at the University of Wisconsin-Madison as well as in Nigeria and at Harvard University. In 1984 she joined the faculty of the University of Puerto Rico. In addition to research in linguistics, she has published articles on anthropology and the arts and currently divides her time between a book on language acquisition and a novel set in Latin America.

My experience traveling and living in other countries led to an interest in language acquisition and historical linguistics, which led me in turn to a career in

the Caribbean where the islands offer a researcher linguistic exotica as varied as the flora and fauna. I work in Spanish-English Puerto Rico which itself is surrounded by such fellow colonials as French and Dutch and the pidgins and creoles created by the "Big Bang" collision of African and European languages during the height of the slave trade and plantation economy. My personal journey from an early interest in linguistics to being a professor-researcher in the West Indies was enhanced to by two years of "training" at the Wisconsin Center.

Professor Peter Schreiber, jointly appointed in the Departments of English and Linguistics, hired me and Richard Williams (I from the former, he from the latter department) as his research assistants in 198 . We were involved in carrying out and analyzing the data of psycholinguistic e periments that, among other things, attempted to discover how crucial prosodic ues are to the first language learner's ability to acquire the structure of the la nguage s/he is exposed to—research that turned out to be relevant to my own di sertation topic. Some of the data we analyzed had been collected by Professor S reiber in collaboration with Professor Charles Read.

Although I had previously carried out experim s of smaller scope, my research assistantship introduced me to larger scale cc orative research and, not incidentally, to the use of computers. (The research sistant and the subjects worked at an Apple PC during one of the experiment . d data from all of them were analyzed using PC and/or mainframe computer

The R & D Center supported "unfunded re: rch" also in the sense that the use of the facility and the professorial and peer c llaboration that were available to research assistants also helped them in their own scholarship. A number of the members of our "RA Bullpen" worked on into the night after the regular Center staff had gone home. My own interest was the development of a "Constituent Analysis Theory of Complexity" in language acquisition. My 1985 thesis presented this theory and the results of experiments in the U.S. and Mexico testing it.

Since completing the Ph.D., I have continued to develop my theory, most recently investigating its relevance to similarities between structures found in pidgins and creoles and those produced by first- and second-language learners. As all roads once led to Rome, all psycholinguistic research leads back to the structure of the brain and is, therefore, ultimately applicable to a general theory of learning.

Although we do not have a comparable R & D Center here at the University of Puerto Rico, just last semester I was involved in the creation of a research assistant program in the College of Humanities. The university has long had research assistants in schools such as Natural Sciences and Tropical Medicine, but this opportunity had never been available to our students. The proposal drawn up to change that included my contribution as new Graduate Program Director for the English Department, which relied on my R & D Center experience. (Even among the seven linguists in an English faculty of 35, I am the only professor who was a research assistant.) Benefiting from a university-wide push to increase all graduate assistantships, our proposal was rapidly approved. I am happy to say that this semester the University of Puerto Rico is able to offer over 30 humanities

graduate students research assistantships. When I was in high school I tutored migrant workers' children; in college I was a Head Start volunteer—it is not unimportant to me that these graduate students are minority students. I am pleased to pass a part of my Wisconsin Center experience on to them.

Nancy Lesko

Assistant Professor, School of Education

Indiana University

In two periods of affiliation with the Wisconsin Center for Education Research, I had opportunities to visit different schools, analyze and write collaboratively, and learn about the strategies of funding research. Because of these opportunities, I left the University of Wisconsin-Madison with broad experience in funded research projects and their intersection with educational policy at the local, state, and federal levels.

Between 1981 and 1983 while a doctoral student, I worked on a project with Gary Wehlage and Cal Stone, examining numerous Wisconsin high school programs for at-risk students. My work on this project provided opportunities to visit four different Wisconsin high schools, conduct a field study in one high school program, collaboratively analyze data from six different programs, and co-author a report on effective programs for marginal secondary school students.

My return to the Wisconsin Center for Education Research came with the funding of the National Center on Effective Secondary Schools. In the spring of 1986 I worked with Mary Metz on a project examining teacher engagement in schools ranging from urban poor to upper-middle-class suburban. Later that year I joined a project examining fourteen programs for students at risk of dropping out, which was directed by Gary Wehlage. The at-risk students project was a national study of preventive dropout programs. I was responsible for studying two programs.

This position with the project on at-risk students offered two major opportunities. First, I had the opportunity to study programs in different parts of the country that served substantially different student populations. To travel to different parts of the country to study schools is an unusual opportunity. Second, the two-year collaboration with the four other project participants was an enlightening and productive experience. I learned much about working collaboratively, respecting other peoples' opinions while disagreeing with them, and experiencing the highs and lows of the research endeavor with others. Many

scholars never have the opportunity to participate in truly collaborative intellectual work. This was a high point of my years of work at the Center.

The project on at-risk students also organized a conference at the Wingspread Center in Racine, WI, for participants of each of the programs we studied during the 1986–87 academic year. Both the organization of the conference and the actual event were instructive. It was especially valuable as a payback for the school people who had been so involved in the year of research.

The members of the project on at-risk students—Gary Wehlage, Bob Rutter, Greg Smith, Ricardo Fernandez, and I—gained infamy in the following year at the Center for our lengthy and spirited meetings. Our meetings typically lasted three to five hours as we analyzed individual programs, critiqued those analyses, and began to construct the outline of our analysis across the 14 programs. We argued, laughed, agreed, revised, and snacked on popcorn (the staple of educational researchers' diets) for hours and hours. We wanted to write a book collaboratively about the successes and limitations of the programs we studied. *Reducing the Risk: Schools as Communities of Support* (London: Falmer Press, 1989) resulted from those untold hours locked in the seminar rooms on the sixth floor of the Educational Sciences building.

As academic staff, I also saw limitations to the contract research in which I was engaged. Conclusions of the studies were constrained by the Secondary Center's institutional needs, for example, the need for one project's findings to support the findings, or thrust, of other projects in the Center. This structure constrains both the kinds of questions that can be asked about schools and the findings of the studies that are undertaken.

As a woman, I also realized that educational research—its assumptions, views of the world, questions, and methods—is highly androcentric. Consequently, ideas influenced by a feminist perspective and female experience do not receive the same attention as ideas more consonant with white, middle class, male experience. Even though the people involved in federally funded research may be well intended and reasonably open minded, the basic assumptions and perspectives operate to maintain a research agenda and staffing pattern most accessible and amenable to white males. This situation has numerous unfortunate consequences for the nature of research, the culture of the Center, and the sponsorship of selected beginning researchers.

Even though not every experience was pleasant, my years at the Wisconsin Center for Education Research have contributed immeasurably to my understanding of the politics and processes of educational research.

Selected Publications

Lesko, N. (1990). Curriculum differentiation as social redemption: The case of school-aged mothers. In R. Page & L. Valli, (Eds.), *Curriculum differentiation: Interpretive studies in U.S. secondary schools.* Albany: State University of New York Press.

Lesko, N. (in press). Implausible endings: Revising the school fictions of teenage mothers. In N. Wyner & S. Sarason (Eds.), *Current perspectives in school cultures.* Cambridge, MA: Brookline Books.

Karen Callan Stoiber

Assistant Professor of Psychology

Northern Illinois University

Karen Stoiber assisted in conducting research in education at the Wisconsin Center from 1982 to 1987. While at the Wisconsin Center, she was awarded the Jean Hankinson Seibel Scholarship by the Wisconsin School Psychologists Association for outstanding student contribution and the Phi Delta Kappa Dissertation Scholarship for distinguished educational research. She is currently an Assistant Professor of Psychology in the Cognitive/Instructional and School Psychology Areas at Northern Illinois University, a position she began after completing a psychology internship in 1988.

As I reflect back on my experiences at the Wisconsin Center for Education Research, the memories flow easily. Perhaps this is because I have been gone only a few years. A more likely reason is the particular *kind* of experiences I had while there.

One such experience promoted problem solving and creative thinking. Professor Penelope Peterson had invited me to be a member of her research project that was investigating how differences in instruction interacted with differences in student learning aptitudes. I remember feeling inspired, and admittedly somewhat intimidated, when I attended my first research meeting. Here questions were posed by Professor Peterson of a provocative kind, such as: How do we assess and evaluate students' cognitions? How might students' aptitudes mediate their attention and understanding? Which problem-solving strategies are associated with higher-order learning? and, What kind of experiences do students need to make their learning more meaningful? The exciting nature of these questions was striking for someone who was a novice researcher. More impressive, however, was the thoughtful manner in which group members constructed and considered responses. It was a lesson in facilitating creative processes that was repeated many times at the Wisconsin Center.

Mentoring by expert researchers was another kind of experience provided at the Wisconsin Center. As a graduate student, I was given not a keyhole glimpse of research productivity but rather an open window from which long gazes were often available. This view allowed me to see how programmatic

research is developed through perseverance and dedicated work. I saw in Dr. Peterson and other WCER faculty researchers a genuine commitment to improving education. Their conscientious efforts helped me realize the importance of research as an integral activity in academic work. This mentorship had a formative effect on my identity as an educational researcher.

Most memorable was the collaborative structure of the Wisconsin Center. Collaboration was apparent on an external level by the number of diverse research projects that called WCER their home. More important, however, were the kinds of experiences that occurred because of the collaborative internal structure of WCER. There was a mutual sharing of the ideal that the understanding gained through well-planned research endeavors would make schools better places. As a graduate student, I came to appreciate how striving toward this ideal sometimes meant formal collaboration of researchers from different disciplines on a single research project. More often, the Wisconsin Center provided an atmosphere in which knowledge was clarified, discussed, and diffused through informal means. Research faculty, staff, and students would engage in dialogue about research issues at WCER-sponsored "brown bag" presentations, in the corridor, or on an elevator. This model of interaction helped me realize how uncovering scientific "truth" requires continual refinement of, and reflection on, ideas.

I believe that these kinds of experiences have contributed in many ways to my professional development. I recognize how one's own cognitive resources can be applied through many of the same processes I came to know at WCER—questioning, mentoring, and collaborating. Based on some of the questions that were explored in Professor Peterson's project, I have questions about teacher knowledge and belief construction that I am pursuing. I use the mentorship provided through WCER activities to think about how to investigate these research questions. In addition, the level of productivity shown by research faculty at the Wisconsin Center for Education Research is a constant motivating and energizing force in my life. I especially attempt to use what I learned from the collaborative atmosphere promoted by the WCER. The Center exemplified that reform in educational policies and practices is produced most effectively when ideas are shared and valued among researchers and across disciplines. In my first year at Northern Illinois University, collaborative efforts were used in combining cognitive, developmental, and school psychology programs into one departmental area. The goal of integrating these knowledge bases in psychology is to increase understanding, which seems to parallel the mission of WCER during the past 25 years.

Selected Publications

Stoiber, K. C., Bracken, B. A., & Gissal, T. J. (1983). Cognitive processing styles in reading disabled and a matched group of normal children. *Journal of Psychoeducational Assessment, 1*, 219-233.

Swing, S. R., Stoiber, K. C., & Peterson, P. L. (1988). Thinking skills versus learning time: Effects of alternative classroom-based interventions on students' mathematical problem solving. *Cognition and Instruction, 5*, 123-191.

Center directors have always been keenly aware of the politics of educational research. Here on June 10, 1966, Center co-directors Max Goodson (far left) and Herbert J. Klausmeier (second from left) present the school improvement strategies of the Center to Wisconsin's U.S. Senator Gaylord Nelson (second from right) and UW Chancellor Robben Fleming (far right).

6 Reflections of the Center Directors and Support Staff

What is the role of a Center director? How and how much, if at all, did it change across 25 years as the Wisconsin Center developed from a tightly knit organization with a single mission of research, development, and implementation to a loosely coupled organization of many centers and projects, each with its own mission? I now sketch the changes that occurred in the organizational, administrative, and staffing arrangements across the 25 years to provide a context for the narratives of the five Center directors, four academic staff personnel, and one representative of the Center's classified personnel that will follow.

From 1964-65 to 1976, the Center's organizational, administrative, and staffing arrangements included a Center director or co-directors, heads of a small number of programs and related projects, and heads of three support programs, called sections: Business and Operations, Technical, and Dissemination and Implementation. The Center's R & D projects were led by tenure-track professors. Graduate students, non-tenure-track academic personnel including research associates and research scientists, and classified personnel—secretarial and technical—completed the staffing arrangements. The Technical Section and the Dissemination and Implementation Section disbanded in early 1976, shortly after support of both curriculum development and the Center's implementation activities ceased. There were a number of committees—executive, policy, advisory, and evaluation—from 1964 to 1976. Each Center director had much autonomy with respect to establishing new committees and continuing existing ones. More committees were needed in the first five years to get the Center's emerging R & D programs on firm footing; fewer were needed thereafter.

From 1976 to 1980, the Center changed from an R & D center to a research center. The administrative, organizational, and staffing arrangements changed accordingly. From 1980 to 1985 the staffing pattern became almost solely professors, graduate students, classified personnel, and a small support group consisting of business and information personnel. There were no middle-level administrators in 1985 and no continuing committees. In 1985 OERI discontinued funding all existing R & D centers and regional educational laboratories. Competitive bidding for centers was put into effect. A totally different Wis-

consin Center for Education Research came into being, consisting of many centers and research projects.

I did not invite the former Center directors or the current one to discuss these changes. Rather, my suggestions to them were to consider items such as these when preparing their papers: reasons for accepting the directorship and for resigning it, personal support they received such as released time from teaching, the main categories of activities they performed, the research they conducted, and satisfactions and frustrations that they may have experienced. The invitation stated that it would not be necessary to describe Center programs or projects in any detail since this was being done in other chapters. I indicated that what I wanted a reader to get from the narratives was a picture of the role and activities of an effective Center director.

I invited the former heads of the Business, Technical, and Implementation Sections to share some of their experiences with us. At present, these former section heads are quite far removed from their earlier Center positions with respect to Center documents, time, and locales. Accordingly, my suggestions to them were to provide some of the highlights of their professional experiences while at the Center. The invitations to Booker Gardner, a former academic staff person, and to Lois Opalewski, the current Center director's secretary, were equally open. Let me close with the idea that a devoted secretary shortens a director's 70-hour work week by 20 hours or more—and how much more enjoyable and productive the 50 hours are!

Herbert J. Klausmeier

Co-director for Research 1964–67, Director 1967–72

Klausmeier's picture and biographical sketch appear in chapter 3, pp. 78-79.

In late 1963 the then Dean of the School of Education, Lindley Stiles, invited me to head a committee to develop an R & D Center proposal for submission to the U.S. Office of Education. This proposal eventuated in the founding of the Wisconsin R & D Center. I was pleased with this invitation and later with becoming Co-director for Research when the Center started operating in September of 1964. I saw the research leadership as an opportunity for attaining a career goal that had been evolving for over 30 years.

In 1931 at age 15 I was one of six seniors in Millersburg High School, located in a poverty stricken farming community of hilly southern Indiana. My role model was the high school principal. He encouraged me to go to college and become a teacher. The Great Depression that hit our family of seven children very hard delayed my college entrance for three years. But after two years at Indiana State Teachers College, I was certificated as an elementary school teacher in 1936, taught two years, went back to college for another two years, and then taught English and history at Pittsboro High School in Indiana in 1940–41.

I spent the years from June of 1941 through June of 1946 as an officer in the Navy. Most of this time was on an aircraft carrier wallowing in the rough seas of the North Atlantic on anti-submarine duty. This Navy experience did nothing to dim my interest in education. After discharge from the Navy I taught social studies in 1946–47 at Reitz High School in Evansville, Indiana. Then I enrolled for the summer session of 1947 at Indiana State Teachers College and completed the requirements for the master's degree. At Indiana State I was in the class of a brilliant lecturer who served as my thesis advisor. He and I talked about careers. I came to believe that being a college professor would be a most desirable way of life. I started graduate study at Stanford University in the fall of 1947. Two years later I was awarded the Ed.D. and was on my way to Colorado State College at Greeley.

The three years at Greeley from 1949 to 1952 were most enjoyable. Being a professor was not work, it was a stimulating intellectual game, even though the teaching load was four four-credit classes per quarter. Despite this heavy teaching load, there was time to write a few articles and one college textbook, get another textbook started, and serve as Chairman of the College Athletic Board.

In 1952 I joined the faculty of the UW School of Education. The intellectual climate at Wisconsin was very different from that at Colorado State. Research was already very strong in the physical sciences and agriculture. It was beginning to be discussed seriously in the School of Education. The UW Graduate School Research Committee made its first small grant to the School of Education in 1952. Being a good instructor was expected of all education professors; however, promotion and salary increments were closely tied to scholarly publication. College textbooks were no-no's; one article in a refereed journal was valued much more highly than two best selling college textbooks.

I secured research support from the Graduate School Research Committee in 1955 and from USOE in 1957. These projects generated interesting findings—and articles in refereed journals. From 1958 through 1962 I led successive research teams in conducting improvement-oriented research cooperatively with three Wisconsin school districts. This research was directed toward identifying the academically talented elementary and secondary school children of the districts and developing appropriate curriculum and instructional programs for them. This was my first experience in working with practitioners in developing new programs, putting them into practice, evaluating their effectiveness from year to year, and refining them. The new programs of these districts emphasized acceleration and enrichment. They had immediate positive effects on student outcomes in both the cognitive and affective domains. Here we had hit on a research paradigm that influenced educational practices quickly and positively. In this paradigm the new programs being implemented were the independent variables, put into practice as the key elements of the research design. With this discovery, I was no longer totally satisfied with being a UW professor who taught three classes per semester and conducted research projects. I would continue these ac-

tivities, but my new goal was to find means of improving education at the national level. The goal in 1931 of becoming a good classroom teacher had evolved into one of making public schooling more helpful to many children, but especially to children of the poor, so that they, like me, could escape the bitterness of childhood poverty and its long enduring painful after-effects. Leadership of the R & D Center provided an opportunity to work toward this goal.

In the development of the proposal in 1963-64 to establish the Center, I exercised participative leadership with my colleagues in a number of areas: conceptualizing the Center's five-year mission, outlining the Center's R & D programs, devising broad strategies for attaining the program goals, and preparing a detailed first-year budget and a programmatic five-year budget. These areas of leadership and the participative leadership style continued after the Center opened. To these areas were added staff recruitment, the monitoring of program and project implementation, and annual evaluation of project performances.

One set of activities was quite time consuming: leading annual project planning that involved meetings with each continuing and incoming project director, then preparing the Center's annual program plan and budget request, and finally negotiating the budget with USOE officials in meetings in Washington, DC. The successive USOE R & D Centers Program Directors, Howard Hjelm and Ward Mason, were most helpful with program planning and budgeting. Monitoring project progress and evaluating performance demanded continuing attention, since I tied budget allocations to project performances. The annual planning process with the project directors, the quarterly reporting of progress required by USOE, and the Center policy of requiring all project directors to document the results of their year's work in one or more Center publications facilitated the monitoring and annual evaluations.

I had much support in administration of the Center from UW President Fred Harrington, Madison Campus Chancellor Robben Fleming, and especially Dean Lindley Stiles, the Center's Co-director for Administration. In addition to this personal participation and administrative support, there were four important committees that started early in the Center's life and functioned very effectively thereafter. One was a Management Council that was responsible for the day-to-day operations of the Center. An Executive Committee made recommendations regarding policies, programs, and budget. A Policy Review Board brought the necessary University resources to bear on the problems that the Center experienced. A National Evaluation Committee conferred annually with Center personnel on the Center's progress. The Committee consisted of nine individuals of national reputation interested in the problem area of the Center and committed to the improvement of education through research.

The National Evaluation Committee provided an invaluable service to the Center, the University, and USOE. At its annual three-day meeting with us, one of its members met with each project team for about one-half day. The members reported to the Chairman in closed sessions of the Committee. All of the Commit-

tee members and the principal investigators met in a final session to hear and discuss the Committee members' reports. Before leaving Madison, the Committee Chairman provided his typed copy of the minutes of the three-day meeting. He and I reviewed the draft, and it subsequently became part of my annual report of Center progress. Benton J. Underwood, Northwestern University, chaired the Evaluation Committee from 1964 to 1972. He is a renowned experimental psychologist who started his educational career as a high school mathematics teacher and coach in Iowa. In 1972, the American Psychological Association awarded him its highly prestigious scientific award. I relied heavily on Ben's minutes in making decisions about programs and projects. So also did University and USOE officials. In fact, our successive USOE project officers from 1965 to 1972 spent very little time on the Madison campus to monitor the Center's progress.

Even with helpful committees and unwavering support from the University administration, Center administration took a considerable amount of time. But, since the Management Council handled the day-to-day operations of the Center, there was some time for research and development. I led successive teams of four to 12 graduate students, full-time project associates, and research scientists in carrying out R & D activities related to three large projects that I directed. These projects continued after I resigned the Center directorship in 1972. The first project involved knowledge-generating research on concept learning as has been described in chapter 3. The main outcome of this project by 1972 was a descriptive theory of concept learning and development. This theory presented the first comprehensive alternative to orthodox Piagetian stage theory of conceptual development at a time when Piagetian theory dominated the field of child development throughout the world. In the second project we conducted improvement-oriented educational research with Wisconsin schools. Individually Guided Education, discussed in chapter 2, emerged from this R & D. IGE continues today as an effective institutionalized alternative to age-graded, self-contained elementary schooling, one-to-one individualized instruction, and open education. In the third project we conducted research on motivation and developed instructional and implementation materials. Here we identified learning activities that enable reluctant learners to achieve success and to experience accompanying feelings of efficacy. Dorothy Frayer reported this R & D in chapter 4.

Being a research administrator and a researcher was made possible by the dedication of the Center support staff, the members of my R & D teams, and by support from the Deans of the School of Education and my colleagues in the Department of Educational Psychology. My teaching was never more than half time during the academic year, none during the summer session. Membership in department, school, and university committees was at my pleasure. Travel and other support was always available. In sum, I defined my job responsibilities and was supported in whatever I did.

I enjoyed doing 99 percent of the Center administrative work from 1964 to 1972. No two days were alike; there was something new, exciting, and different

every day. The months and years from 1963 to 1972 passed very quickly. There were many things to appreciate then as well as now in retrospect, especially the high enthusiasm, boundless energy, and productivity of the whole Center staff. They generated much new knowledge and disseminated it widely. By 1972 outcomes from our R & D activities had already gotten to many children, and a five-year plan to extend implementation nationwide had been approved. Along with these accomplishments, the Center staff had developed research and other skills. Across the years, many had progressed from novices to experts to national leaders.

Relative to housing, the Center began its existence in two smelly basement rooms of the "Old Education Building." In 1972 the Center moved into the largest and possibly the best equipped educational research facility in the nation and the world. Dan Woolpert gives us more details regarding the facility later in this chapter.

We now return to the nonsatisfying one percent of my activities as Center director. Nearly all were related to decisions that affected my peers and colleagues. The first situation involved Max Goodson, an esteemed colleague, whom Dean Stiles appointed to succeed him as Co-director for Administration in 1965. Max and I could not agree on the funding of projects; however, project funding was tied directly to accomplishing the Center's R & D mission for which I was responsible. This was resolved only when Dean Donald McCarty accepted Professor Goodson's resignation in 1967.

Two nagging matters arose in connection with Center staffing. Our policy was for professors who affiliated with the Center to continue in the Center as long as they desired, provided that their projects produced outcomes, including reports, in accordance with the annual time schedule and as initially planned relative to contributing to the attainment of the Center's mission. Based on the judgments of the National Evaluation Committee mentioned earlier and the monitoring system implemented through the Business and Operations Section, I recommended the cessation of a few projects from 1966 through 1972. This seemed appropriate in view of the intense competition among R & D centers and regional educational laboratories for USOE funding and the small amount of center funding relative to the work to be accomplished. In general, professors who discontinued their projects understood this rationale.

The staffing pattern of the Center unavoidably contributed to the development of an in-group and an out-group of professors in the School of Education. The small in-group of professors and their graduate student assistants were supported not only for their R & D activities but also for travel, convention participation, and publication. The large out-group had difficulty in getting USOE support inasmuch as the University through the Center was already getting a large slice of the USOE pie. Not only USOE but other funding organizations were reluctant to support individual research projects of professors.

These matters associated with personnel were not the main factors that led to my resignation as Center Director. Even the many hours spent in meetings and air travel were not. Rather, since the five-year plan had been approved, I preferred to spend more time on two tasks. One was to accelerate my research on the learning and teaching of concepts. I had reported my first theoretical formulation in my Presidential Address to the Division of Educational Psychology of the American Psychological Association in August of 1971 and wanted to refine it. A more important factor was to get the Individually Guided Education inservice and preservice teacher education programs and materials developed with the support that had been made available from The Sears-Roebuck Foundation. Even though these materials did not become commercially available until 1976, they were urgently needed in 1972–73 by the state education agencies in leading the implementation of IGE and by teacher education institutions in offering noncredit inservice programs and both undergraduate and graduate courses that focused on IGE concepts and practices. I was certain that these materials would contribute greatly to the implementation and institutionalization of Individually Guided Education and thereby to improving the quality of education for children across the nation. From 1972 through 1976 I spent far more hours per week on this project than I had earlier as Center Director.

The Center had exemplary programs of product development and implementation through 1976 that contributed markedly to improving education. I recognize with much disappointment that since then leadership in educational product development, implementation, and educational improvement is not rewarded in our great research schools and colleges of education. I point out, however, that the same is not true for equally prestigious professional schools, for example, agriculture, engineering, law, medicine, and pharmacy. Just as these schools and colleges continue to lead the way in the improvement of practices, so also each state needs at least one university-based organization to lead the way in the improvement of educational practices in the state.

Selected Publications on Educational Research and Development

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Klausmeier, H. J. (1972). Educational research: From the R & D Centers into practice. *Educational Leadership*, 598-601.

Klausmeier, H. J. (1975). A decade of federally supported R & D and a related proposal for change. *Journal of Teacher Education, 26*, 160-165.

Klausmeier, H. J. (1977). Proposals for change in federal policy on educational research, development, and implementation. *Phi Delta Kappan, 59*, 31-32, 49-50.

Klausmeier, H. J., & O'Hearn, G. T. (Eds.). (1968). *Research and development toward the improvement of education*. Madison, WI: Dembar Educational Research Services.

Richard A. Rossmiller

Director 1973–80

Professor, Department of Educational Administration

University of Wisconsin-Madison

Richard A. Rossmiller, Professor of Educational Administration, received his Ph.D. degree from the University of Wisconsin-Madison in 1960. He served as Hall Principal at Evanston, Illinois, Township High School and as Superintendent of the Muskego-Norway, Wisconsin, Consolidated Schools before accepting a position as Assistant Professor of Educational Administration at the University of Wisconsin-Madison in 1961. During the 1968–69 academic year he was a visiting professor at the University of Florida; from January to July 1977 he was a visiting professor at the Catholic University of Rio de Janeiro, Brazil; and in 1986 he served as a lecturer at the University of Damascus, Syria. Professor Rossmiller served as chairman of his department in 1972–73, as Director of the Wisconsin Center for Education Research from 1973 to 1980, and as Chairman of the Department of Educational Administration from 1981 through 1990. He served as Chairman of the Council for Educational Development and Research in 1975–76, as President of the American Education Finance Association in 1980–81, as President of the University Council for Educational Administration in 1984–85, as a member of the National Commission on Excellence in Educational Administration from 1985 to 1987, and currently serves as a member of the Standing Committee of the International Intervisitation Programme. Mr. Rossmiller has authored or co-authored more than 75 articles, monographs and chapters in books. He has been an expert witness in 12 court cases involving state school finance and employment discrimination and has served as a consultant to states, national agencies and organizations, and other countries and other international organizations.

My involvement with the Wisconsin Research and Development Center for Cognitive Learning, the official name of the Center at that time, began during the spring of 1972 when Herb Klausmeier invited me to submit a proposal to study the cost-effectiveness of Individually Guided Education (IGE). Little did I know that within a year I would be serving as director of the Center. My experience as a researcher in the National Educational Finance Project from 1968–72, and particularly my experience in directing the research on the cost of educating exceptional children, led to a decision to learn more about how the components and ingredients of educational programs affect student learning. The opportunity

to study the cost-effectiveness of IGE gave me a chance to conduct the research in which I was most interested.

When Professor Klausmeier announced his resignation as Center director in 1972, my name was submitted to the search committee. Serving as director of a research and development center was low on my list of priorities at that time, but Dean Donald McCarty eventually persuaded me that I was the person best qualified for the job and that I could best serve the university and the School of Education in that position.

January 1973 was a time of great optimism. The Center's proposed program of work in Individually Guided Education (IGE) had been accepted in its entirety with the assurance of three years of funding. The new National Institute of Education, which many envisioned as an educational clone of the National Science Foundation and which was expected to insulate educational research funding from the day-to-day vagaries of Washington politics, had begun operation. Much of the work in our proposal which NIE had accepted for funding involved development of curriculum materials for use in Individually Guided Education, particularly the *Wisconsin Design for Reading Skill Development* and *Developing Mathematical Processes*, as well as funding to continue dissemination and implementation of IGE across the nation. The Center's academic staff had been expanded in 1971 and 1972 by employing individuals with expertise in curriculum development, evaluation, and implementation. The Center's administrative staff also had been enlarged with the employment of a deputy director, the development of an in-house computing capacity with associated support personnel, and a personnel office. In addition, Herb Klausmeier had received a major grant from The Sears-Roebuck Foundation in 1972 to support implementation of IGE.

Our task of implementing IGE was soon complicated when the Institute decided it would not support further implementation work until it had developed an implementation policy. This decision created very serious problems for us because the Center had established working relationships with several states and was providing both financial support and technical assistance in their IGE implementation efforts. Consequently, at the very time when continuing financial and technical assistance to these states was most crucial in the implementation of IGE, the Center was forced to renege on its agreements and to substantially reduce the support it provided.

It soon became clear that the National Institute of Education would not stand above the political fray and that educational research funding would continue to be in jeopardy. In the early spring of 1974 I received a frantic telephone call from Washington reporting that the Senate Appropriations Committee was threatening to provide no funds for NIE. This event kicked off what was to become an annual struggle to secure funding for NIE, since the Center's program of

research and development was entirely dependent on NIE for its funding at that time. NIE's 1974 budget eventually was cut by $35 million (from $110 million in 1973 to $75 million for 1974). As a result the Center's budget for 1974 had to be reduced from the 1973 level, rather than increasing as called for in the original grant document, thus requiring us to postpone or eliminate new research initiatives, stretch out development schedules for curriculum products, and reduce even further our commitment to support IGE implementation activities.

In part as a result of its funding problems, and in part because of the criticism the National Science Foundation received for the "Man: A Course of Study" curriculum it had funded, NIE decided to deemphasize curriculum development and implementation and redirect its increasingly meager budget toward research. This decision also posed serious problems for the Center, not only in supporting implementation of IGE but also because a heavy commitment had been made to complete three major curriculum projects directly related to IGE—the *Wisconsin Design for Reading Skill Development* under the direction of Professor Wayne Otto, *Developing Mathematical Processes* under the direction of Professor Thomas Romberg, and the *Pre-Reading Skills Program* under the direction of Professor Richard Venezky. In view of the substantial investment already made in these programs, and their widespread adoption in schools throughout the country, both IGE and non-IGE, terminating these curriculum programs would have been wasteful and irresponsible. Securing the funding necessary to complete these programs required constant negotiation and discussion with NIE program officers as well as a reduction in the Center's investment in basic research in order to complete the curriculum programs.

NIE's funding difficulties also led us to explore opportunities for expanding the center's base of funding. We submitted a successful proposal to the Bureau of Education for the Handicapped, U.S. Office of Education, in 1974 for support of what came to be known as "Specialized Office Three." This office was part of a national network responsible for identifying, abstracting, and entering into a national database materials, curricula, and instructional programs and processes for handicapped children. Specialized Office Three foreshadowed the later development of the Center as a holding company for a variety of research and development projects with funding from several sources rather than relying entirely on a core grant from one federal agency.

The Institute's continuing difficulty with congressional appropriation committees led me to become increasingly involved in the work of the Council for Educational Development and Research (CEDaR), a consortium of university-based research centers and regional laboratories. I served as a member of the board of trustees for several years and as chairman of the board during 1975–76. NIE was scheduled for congressional reauthorization in 1976, and the CEDaR decided to strongly support its reauthorization, and also to seek a line-item appropriation for labs and centers within the NIE budget. At the same time, we engaged in intensive discussions with NIE Director Bud Hodgkinson and members of his staff in an attempt to define clearly the relationship between labs and centers and the Institute. The language of NIE's reauthorization provided a line-

item appropriation to support labs and centers and directed that a "Panel for the Review of Laboratory and Center Operations" be established. The discussions with Hodgkinson and his staff resulted in agreement by NIE to solicit three- to five-year institutional plans from the labs and centers that would be reviewed by the external panel mandated in NIE's reauthorization. The reorganization and expansion of the Center's administrative staff that occurred early in the 1970s had been funded as part of the Center's core grant from the Office of Education. With the advent of NIE, these support activities had to be funded from overhead. The university agreed to establish a separate overhead rate for the Center and to reduce the overhead rate it received on grants and contracts awarded to the Center. This separate overhead rate was to compensate for the budgeting, accounting, personnel and other activities being handled by members of the center staff. This overhead arrangement proved to be very important because it provides the funding for the administrative and support activities provided by the Center for Education Research today.

One issue which persisted throughout the 1970s was that of devising governance mechanisms that would give principal investigators and members of the academic staff an opportunity for input on Center policies and procedures. Principal investigators sometimes expressed concern that they did not have a voice in establishing Center priorities when budget decisions were made and, from my point of view, it was important that principal investigators understand how the various projects were related to the whole program if we were to maintain a coherent program of work. Following extensive discussions with principal investigators, a faculty council comprised of all principal investigators was established in 1974 to advise the director on the substantive program of the Center. A planning and policy committee comprised of the principal investigators heading each of the major program areas was established in 1976. These two bodies facilitated greater faculty involvement in program planning and were particularly helpful in developing responses to NIE's constantly changing agenda. External activities demanded more and more of my time, but fortunately in 1976 Professor Wayne Otto agreed to serve as associate director of the Center with primary responsibility for program planning and internal operations. He became co-director in January 1977 when I went on leave for six months to serve as a visiting professor at the Catholic University of Rio de Janeiro.

The phaseout of curriculum development activities and budget reductions resulting from NIE's appropriation problems placed mounting pressure on the Center's overhead budget. Our experience in competing for grants and contracts from other agencies led us to conclude that the Center's overhead rate was too high, making it difficult to compete successfully against other bidders. Consequently, the operations of the personnel office and the business office were combined, the position of deputy director was eliminated, and in-house computing was eventually phased out.

During the period 1975–78, principal investigators, particularly those who served on the planning and policy committee, became increasingly involved in

setting priorities, evaluating proposals for new work, and managing day-to-day activities of the various projects. By 1977 we were heavily involved in developing the plan for a three- to five-year program of work to be reviewed by NIE staff and by the panel for review of laboratory and center operations mandated by Congress. Hodgkinson's resignation as NIE director in January 1977 placed lab-center planning activities on hold for several months pending appointment of the new director, Patricia Graham, in late spring. The Center's five-year plan was developed and submitted for review by NIE staff and by the Panel for Review of Laboratory and Center Operations in the fall of 1977. Initial reviews of the planning documents produced rather discrepant critiques, with the Panel providing a very positive review and NIE staff a somewhat negative review.

Planning activities continued during the first half of 1978 and the Center was renamed the Wisconsin Research and Development Center for Individualized Schooling to reflect the focus on individualization and the emphasis on research related to individualization of instruction being proposed in the new plan. In the meantime, an interim grant covering an 18-month period was negotiated pending final recommendations from the lab/center review panel.

My original commitment had been to serve as Center director for at least five years, and it seemed an appropriate time for new leadership. Consequently, Wayne Otto and I submitted our resignations to Dean John Palmer in April 1979, but I agreed to continue until a new Center director could take over. This proved to be longer than I had anticipated, because Mike Smith was not available to assume the directorship until August 1980.

In the meantime, Professor Dale Johnson agreed to serve as associate director of the Center and a task force consisting of former Dean Donald J. McCarty, Professor Robert Tabachnick, and Professor Louise Cherry Wilkinson was appointed to help develop a detailed document on individualized schooling and a revised five-year plan for research and development on that topic. Dale and I worked closely with the task force and with Ramsey Selden, who had been designated by NIE to be the Center's program monitor. The efforts of the task force members, the planning and policy committee, and principal investigators culminated in a proposal for five years of work organized around the theme of individualized schooling. This proposal was accepted by NIE and the Center was invited to enter into a five-year funding agreement. Thus, base funding for the Center was assured, permitting Mike Smith to devote his attention to expanding the Center's funding base and reducing our reliance on a single funding source, a task he did superbly well.

When I became Center director in January 1973 I told Dean McCarty that one of my primary objectives would be to integrate the Center more completely into the School of Education and the University of Wisconsin-Madison. I believe this objective was accomplished. I am pleased that integration of the Center into the fabric of the university has continued and expanded since 1980 under the direction of Mike Smith, Carl Kaestle, and Andy Porter.

Unfortunately, during my years as Center director my own research agenda was badly neglected. Thanks to the efforts of some remarkably able graduate students, particularly Joseph Marinelli, now superintendent of schools in Livonia, Michigan, and Terry Geske, currently chairman of the Department of Educational Administration at Louisiana State University, I was able to continue some work on studies of cost-effectiveness. I continued to serve as a principal investigator in the Center after leaving the directorship and completed a major study of resource utilization in schools and classrooms as part of the program on individualized schooling. The results of my research on cost-effectiveness strengthened my belief that money is necessary, but not sufficient, to ensure high student achievement. The results of the research on resource utilization in schools and classrooms underlined the very significant role teachers play in the academic achievement of elementary school students. My present research dealing with the relationship between quality of teacher worklife and student engagement in secondary schools is part of the research program of the National Center on Effective Secondary Schools within WCER and reflects my continuing interest in educational productivity.

Selected Publications

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Rossmiller, R. A. (1984). *Final report of the state superintendent's task force on teaching and teacher education*. Madison: Wisconsin Department of Public Instruction.

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Marshall S. Smith

Director 1980–86

Dean, School of Education

Stanford University

Marshall (Mike) Smith came to the Center from Washington, DC, where he had been since 1973 as visiting scholar and later Associate Director of the National Institute of Education, assistant commissioner for policy studies in the U.S. Office of Education, and chief of staff to the first secretary of the U.S. Department of Education. Earlier he earned his A.B. at Harvard College in psychology and Ed.D. in measurement and statistics from the Harvard Graduate School of Education. Smith was an Associate Professor at Harvard University and taught in the Human Development and Educational Policy program. He was also a co-founder of the Huron Institute where he directed Head Start Planned Variations, a national evaluation. Currently he serves on many committees including the Secretary of Education's Committee on Educational Indicators, the Advisory Committee for NSF's Science and Engineering Education Directorate, and the Advisory Committee for GAO's Program Evaluation and Methodology Division. Smith is a consultant to the Carnegie Corporation of New York, the Ford Foundation, the Rockefeller Foundation, and the U.S. Department of Education. In 1979 Smith received the Commissioner's award for "Significant Contributions to U.S. Education" from the U.S. Office of Education, and in 1980 he received the Secretary's award from the U.S. Department of Education. He is a member of the National Academy of Education.

The primary causal stimulus for my coming to Wisconsin was probably a phone call from Michael Olneck telling me that there was a national search for a Director of the Center. Michael's call coincided with my decision to leave the government after seven years. The Directorship of the Center with, in my case, tenured professorships in Educational Policy Studies and Educational Psychology was a very strong package. These attractions, together with the facts that UW-Madison is a world-class university and that Madison is a great place for kids, made our decision to come to the UW very easy.

I essentially controlled my own time—a luxury I no longer have. I taught few courses, too few in retrospect, and had almost no responsibilities within the school or University, outside of the Center. Again, in retrospect, a mistake for me personally. The immediate staff of the Director, particularly Lois Opalewski, Janice Patterson, and Debbie Stewart, were terrific. Over the six years I was Director I was also blessed with four superb research assistants, Stewart Purkey, Mark Van Pelt, John Jenkins, and Larry Stedman.

One of the first administrative tasks that I had when I came to the Center was to reduce central administrative costs, particularly in the areas of the Director's office, computing and publications. We eliminated the role of co-director, and over time we moved from an old and costly mainframe to the use of microcomputers for all administrative computing and reorganized the publications functions to focus more on research publications. Most of the other excellent Center support services remained in place while I was Director.

The central fiscal task that I inherited was to reduce the reliance of the Center on a single federal grant. This coincided with my interest in broadening the programmatic scope of the Center to address a wide range of issues in education from research on teaching and learning to state and federal policy issues. The strategy was to create a research home for people interested in educational research drawn from a variety of social and behavioral science departments and schools throughout the University. My personal commitment was to help create a Center that tackled the broad range of educational issues, but with a particular focus on the needs of the most disadvantaged in the society. Because of the availability of research space and the support services of the Center, this proved to be a feasible strategy both to put the Center on a solid financial basis and to create a lively intellectual research environment. In the last two years of my time at the Center we were particularly fortunate to achieve considerable success in the national center competition, winning one center completely while sharing parts of three other centers.

My primary research interest during the time I was Center director was in educational policy at the federal, state and local levels. I was fortunate to be able to collaborate with Jenkins, Stedman, and Carl Kaestle on publications that examined the history and current state of education reforms with a focus on federal and state policy initiatives. In the areas of school building, local, and state policy I worked closely with the Council of Chief State School Officers in the development of the education indicator movement. I also had the great opportunity to collaborate with Janice Patterson in the area of the use of computers in education. Finally, I was fortunate to be able to spend considerable time thinking together with Bill Clune and Janice Patterson about educational policy issues at all levels of government—a collaboration that culminated with WCER being part of a consortium that won the competition in 1985 for a national center for policy research.

During the time I was at the Center we received great support and freedom from Dean John Palmer. As far as I can tell we were ignored by the academic administration of other parts of the University. And, by and large we operated without serious constraints from University and state procedures. In part, this was due to the quality of the Center's staff—they knew how to operate effectively within the constraints of the University and the state. I also never perceived serious constraints from the federal government, apart from a general reduction in funds available for educational research. During the early 1980s we started to expand the possible funding sources for the Center to agencies other

than OERI, such as NSF. On the frustration side I would have liked to have had more success in attracting foundation support for the Center. I would also have liked to see closer connections between WCER and some of the other policy oriented centers at the UW. Similarly I was disappointed in our lack of productive contact with the state and the local Madison education policy systems. I hope that the increasing national interest in education and Andy Porter's dynamic leadership will help change that situation.

Selected Publications

Ginsburg, A. L., Smith, M. S., & Turnbull, B. J. (1981). Directions for federal elementary/secondary educational policy. In R. Miller (Ed.), *The federal role in education: New directions for the eighties*. Washington, DC: Institute for Educational Leadership.

Jencks, C. S., with Smith, M. S., et al. (1972). *Inequality: A reassessment of the effect of family and schooling in America*. New York: Basic Books.

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Smith, M. S., & Jenkins, J. W. (1983). Legislation. In H. Mitzel (Ed.), *Encyclopedia of educational research* (5th ed.). New York: Macmillan.

Stedman, L. C., & Smith, M. S. (1983). Recent reform proposals in American education. *Contemporary Education Review, 2(2), 85-104*.

Carl F. Kaestle

Director 1986–88

William F. Vilas Professor, Departments of Educational Policy Studies and of History

University of Wisconsin-Madison

Carl Kaestle received his B.A. magna cum laude from Yale in 1962; his M.A.T. (1964) and his Ph.D. (1971) are from Harvard. He was the principal of the American School of Warsaw, Poland, from 1964 to 1966. During his graduate school days he served as an intern teacher of high school English at Newton, Massachusetts, and as a Teaching Fellow in the History Department at Harvard. He came to Wisconsin in 1970 as Assistant Professor of Educational Policy Studies and History and was appointed a William F. Vilas Professor in 1988. Kaestle has served as President of the History of Education Society (1980) and Vice President of the American Educational Research Association (1985–87). In 1981 he was elected to the National Academy of Education, which he served as Vice President from 1987 to 1989. He has been a Visiting Fellow at the Shelby Cullom Davis Center for Historical Studies at Princeton, the Charles Warren Center for Studies in American History at Harvard, and the Center for Advanced Study in the Behavioral Sciences at Stanford.

My association with the Center began in 1980, when I served on the search committee that recruited Mike Smith. After he arrived, Smith and Dean Palmer organized an advisory committee for the Center, and I served on that committee for Mike's entire tenure. In 1983 I also became a faculty associate at WCER, with support from the federal core grant at first, then from the Spencer Foundation, to study the history of literacy and adult literacy policy issues.

I became a great admirer of Mike Smith. I thought he was doing a superb job as Director, with his Washington savvy, his relish for policy analysis, his versatile knowledge of research, and his skill at organizing people and proposals. Having helped us get through the great "recompetition" of 1984–85 in excellent shape, Mike decided to accept Stanford's offer to become dean in spring of 1986. That decision came in May, too late for us to mount a national search for a new Director. I strongly believed that we should have a national search for a person with Washington experience and national visibility, and I believed that we could attract such a person. I was not such a person, but I had had some administrative experience, I was very pleased with the staff and facilities of the Center, and I thought I could help with the search; thus, I agreed to a year's stint as an interim director.

There were two big unknowns in the Director's office when I arrived: Would we be able to recruit a first-rate director? and What kind of a center were we? We were no longer a single federally budgeted center with a theme, but I thought that we should be something more than a mere collection of research projects that shared business services. My job, then, was to explore the structure and the identity of the new Center, keep our busy researchers as happy as possible, and then make our virtues obvious to both the local and the national community of education researchers. I had two personal advantages in this work. First, I knew the University well and had good relationships with many faculty and administrators outside the Center. I knew how the place "worked." Second, at the time I became Director, I was particularly active in groups like the National Academy of Education and the Council of AERA. I set out to assure the world that WCER was thriving, that we were a center of excellent research and that we fostered it through excellent facilities and excellent support from our School of Education and University. This part was easy; all of this was true without my lifting a finger. When my fingers did lift, it was to do some staff restructuring, to oversee a new and changing budget situation, to assist groups who were interested in competing for grants, to maintain effective support services for ongoing projects, to rebuild some publicity capacity in the Director's office, to act in general as the Center's host at home and envoy abroad, and to act as a consultant to the search committee.

As an interim Director, I was obviously not seeking bold new ventures; I sought to manage changes already underway and nudge them in the right direction. Our outstanding researchers kept up our reputation for ideas and our capacity to attract research money, and our outstanding support staff adapted to many stressful changes and expansions of responsibilities. The total budget grew during my time, and the complexity of the business operations increased rapidly as we ran to keep up with eighteen grants, each with separate directors and different rules, reporting schedules, and budgets. Without veteran staff I would have been lost—the business office, the Director's office, and the other support units were uniformly filled with good-willed, hardworking, bright people. I believed this before I agreed to serve as Director, and it proved a sound instinct. This wonderful staff, plus the pleasure of working with John Palmer, combined with my strong interest in the future of the Center to console me when I sometimes felt weighted down by the normal daily business of a large organization: hiring, evaluations, reclassifications, space, equipment, and other such matters.

Our search committee identified the best potential director in the country—Andy Porter of Michigan State—and, through lengthy negotiations, succeeded in hiring him, but only after extending him a year's grace to witness his eldest son's senior year in an East Lansing high school. Thus, my one-year assignment extended to two, with my willing consent. I was immensely pleased about Porter, and no one had thrown rocks at me yet. Research stayed too much on the back burner, though I did manage to publish a few articles and a coauthored monograph on adult literacy entitled *The Subtle Danger*, and I did a lot of speaking

in front of groups interested in adult literacy research and training. I also taught a course during the spring of my second year as Director, which stretched my time pretty thin. But I knew that Andy Porter was about to arrive.

Our faith that we needed a nationally visible research leader as Director has been sumptuously rewarded by Porter's brief year-and-a-half in Madison: new grants, new programs, new ideas, and new people are popping up every day at WCER.

It was sometimes hair-raising to be the interim Director at a time of such change, but it was fun too, and the deck was stacked in my favor. We succeeded in our main goals: a successful search and increased visibility for the new WCER. It is now a federation of grants, with enough support from outside and from the University to encourage the same level of excellence that characterized the Center in its earlier incarnations.

Selected Publications

Kaestle, C. F. (1973). *The evolution of an urban school system: New York City, 1750-1850.* Cambridge: Harvard University Press.

Kaestle, C. F. (1983). *Pillars of the republic: Common schools and American society, 1780-1860.* New York: Hill & Wang.

Kaestle, C. F. (1985). The history of literacy and the history of readers. In E. Gordon (Ed.), *Review of research in education* (Vol. 12). Washington, DC: American Educational Research Association.

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Andrew C. Porter

Director, 1988–present

Professor, Department of Educational Psychology

University of Wisconsin-Madison

Andrew C. Porter has been a professor of educational psychology and director of the Wisconsin Center for Education Research at the University of Wisconsin-Madison since 1988. From 1967 to 1988, he was on the faculty at Michigan State University, where he was promoted to associate professor in 1970 and full professor in 1974. At Michigan State, he served as Director of the Office of Research Consultation (1967–73), Director of the School for Advanced Studies (1979–81), Associate Dean for Research in Graduate Study (1981–85), and Co-Director of the Institute for Research on Teaching (1981–88). From 1974 to 1976, while on leave from Michigan State, he was at the National Institute for Education in Washington, DC, first as a visiting scholar and then as Associate Director of Basic Skills Research.

Porter's research spans the areas of psychometrics, student and teacher assessment, research on teaching, and most recently, education policy. Funding for this research has come from the National Institute of Education, the National Science Foundation, and the Office of Educational Research and Improvement. Active in professional organizations, he has served on the advisory board for seven professional journals including, currently, the American Journal of Education, Journal of Educational Statistics, *and the* Journal of Teacher Education *(chair). He is a member of a number of national advisory boards (e.g., Educational Testing Service's Teacher Programs Council) and is active in providing leadership for professional organizations (e.g., Program Chair for the 1990 annual meeting of the American Educational Research Association).*

Porter has a B.S. in education from Indiana State University (1963) and a master's degree (1965) and a Ph.D. (1967) in educational psychology from the University of Wisconsin-Madison.

As the fifth and most recent director of WCER, I am the direct beneficiary of the excellent leadership the Center has enjoyed over its 25-year history. The center I came to in July of 1988 had just passed with flying colors its most difficult test. The days of the so-called "core grant" were over, and the days of separately funded projects, each with its own timeline, scope of work, and budget, were at hand. Weaning the Center from its core grant days was a painful process, which left its scars; but the result is an even more robust and vital center for education research.

Today, WCER research spans a range of topics from the study of master's degrees to the improvement of first-grade mathematics instruction. There are projects focusing on the teaching, learning, and assessment of mathematics, science, social studies, and English. Work is in progress that will improve education materials and curriculum, help develop new teaching methods and procedures, and lead to recommendations for better ways to structure classrooms and schools. Two dozen separately funded projects support the work of over 50 faculty and academic staff and more than 40 graduate assistants. The budget in 1989 dollars is considerably more than twice that of the largest budget during core grant days.

Leadership at WCER has not just come from the director's office. WCER's success is based on creative faculty, experienced academic staff (many of whom have been with the Center for many years), and an outstanding team of editorial, artistic, clerical, and administrative support. WCER's success is also a function of a supportive university environment.

There were several reasons why I accepted the invitation to become WCER's Director. First, WCER is one of the oldest, largest, and most productive education research centers in the world. As one who had managed education research for nearly 10 years at Michigan State University and prior to that in the federal government, I saw coming to the Center as an opportunity to join the best.

Second, I was anxious to bring together the previously separate and distinct lines of inquiry: teaching, learning, curriculum, assessment, and leadership. At Michigan State University, the focus was on teaching and teacher education. My own research was on modeling teachers' decisions about what to teach. But the more we accomplished in understanding good teaching practices, the clearer it became that good teaching is only one of several important pieces in producing excellent instruction. This, of course, should surprise no one, although the field of education research has a history of focusing on one piece of the puzzle at a time to the exclusion of the other pieces. The University of Wisconsin-Madison and WCER have the breadth of interests and expertise to pull the pieces together in ways that will clarify effective instruction and how it can best be promoted.

A third reason why I was drawn to WCER is as much a statement about the University of Wisconsin-Madison as it is about the Center. Here there is a strong tradition of scholars from across the University joining together to work on significant applied problems. Education is no exception; WCER researchers come from economics, sociology, English, law, and social work, as well as from several areas of specialization within the education school. Working in this interdisciplinary environment is especially productive and exciting.

Not all of my reasons for deciding to become WCER director were as calculated and rational. I'm a graduate of the University of Wisconsin-Madison; I loved the University as a student, and I do today.

WCER is not without problems, however. When I arrived, the Center was running an approximately $30,000 a year deficit in providing support and services

to projects. Much too large a percentage of total funding came from the Office of Educational Research and Improvement in the U.S. Department of Education, and most of that funding was due to expire at the same time. Most of the Center's work was research; there was relatively little activity explicitly connecting research to practice. The University had decentralized its computing, but the Center had not yet picked up the slack. There were too few minority scholars doing work in the Center and, to a lesser extent, too few women. There was relatively little communication across projects in ways that might make the Center's overall program more than just the sum of its parts. All of these challenges remain, but some progress has been made.

Two measures have been taken to bring overhead income into line with expenditures. The operating budget of WCER comes primarily from state dollars budgeted from the School of Education and overhead dollars generated from contracts and grants. The state dollars cover the Director's salary and some cost sharing of professors' salaries on OERI funded research centers (e.g., the National Center for Effective Secondary Schools). Overhead dollars come from an agreement with the University for WCER to receive 18.5 percentage points of overhead from each full overhead-bearing grant or contract (full overhead at the University is currently 45 percent). WCER had been providing to projects out of overhead funds a number of services that, in other parts of the University and on other campuses, would have been a part of direct costs. These included computing supplies, computer service, telephone usage, and general office supplies. One budget balancing strategy, then, was to include these items as a part of direct costs in all new projects. Second, foundations typically do not allow overhead, and most states and some federal grants (e.g., training grants) pay substantially less than full overhead. For projects funded from these sources, items typically covered in overhead are now budgeted as direct costs, including, for example, administrative assistance and accounting. These two measures, in combination, have created a balanced budget for WCER.

The Center has worked hard to diversify its funding base. In the past year, for example, the Center increased the amount of external R & D support by 57 percent through the acquisition of twelve new projects, not one of which is funded by OERI. Currently, WCER project dollars are distributed in the following percentages across sources: OERI, 32.6 percent; support from other parts of the U.S. Department of Education, 16.1 percent; National Science Foundation, 14.9 percent; U.S. Department of Health and Human Services, 8 percent; private foundations, 26.4 percent; other, 2 percent.

WCER is committed to research that holds promise for the improvement of practice. Becoming engaged in the process of translating research into practice and seeking to learn from practice promising new directions for research both provide evidence of that commitment. WCER's Upper Great Lakes Multifunctional Resource Center draws on research from other WCER projects in efforts to strengthen schools in a four-state region. WCER's newly acquired Center for Ef-

fective Schools, funded by the Olin Foundation, substantially strengthens our connection to practice. As we bring our research to bear on school improvement through this new center, we hope to steer the effective schools movement in a direction that takes it closer to the classroom and to direct efforts to strengthen teaching and learning.

WCER continues to struggle with the lack of adequate centralized computing support on campus. In the past year, however, the Center has recruited a new computer specialist to its staff to assist projects in hardware acquisition and software support. The Center is in the process of recruiting for a new position that will provide Center projects with expertise on computer networking and statistical analyses. Our goal is to make WCER as supportive of large-scale quantitative research as it has become supportive of case study and ethnographic research.

WCER is also at work trying to increase its number of minority scholars. One mechanism has been to create a WCER/School of Education cosponsored program of visiting minority scholars. Begun in the fall of 1989, there are to be up to six minority scholars each year invited to campus to give symposia on their work and to interact with faculty and students. Their presence on campus ensures greater visibility for minority scholars in education. The hope is that these individuals will leave our campus as advocates of our programs and ready to assist us in recruiting minority students and faculty.

Enhancing communication across projects is an especially difficult problem to solve. First, each project in the Center begins with a tightly structured scope of work, a set of deliverables, and timelines that must be followed. The contracts and grants competitive process militates against cooperative work across projects. Second, the Center's projects are housed on six separate floors in the educational sciences building. Projects are separated by geography; each floor has one or more conference rooms, but there are no spaces designed as common meeting areas where people routinely come together to share ideas and progress. One possible mechanism for connecting WCER's projects is through jointly planned and offered summer institutes for practicing educators. The newly acquired Center for Effective Schools has a history of providing well-attended summer institutes and will create the mechanism for this initiative starting in the summer of 1990.

While WCER does hope to enhance communication and cooperation across projects, there is no intention to create a tightly coupled organization with a highly focused mission. Many argue that a research center must have coherence, but if coherence translates into narrowness, as it often seems to, then coherence should not be our goal. WCER's purpose is to foster high quality research in education. We do this through a variety of mechanisms designed to enhance the research productivity of University faculty and staff. Speaking now as a senior researcher, not as director, WCER does this very well.

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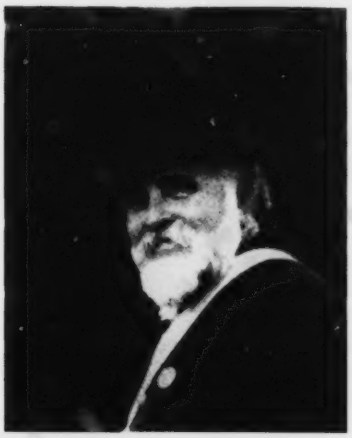

Danny Guy Woolpert

Director, Business Section

With WCER 1964–83

Administrator, Department of Civil and Environmental Engineering

University of Wisconsin-Madison

Dan Woolpert was born and raised in north central Indiana, graduating from Logansport High School. He completed a bachelor's degree in Music Education at Indiana University in 1956 and spent the next six years teaching instrumental music, first in two townships near Marion, Indiana, and then in a consolidated high school near Kokomo. Woolpert came to UW in the fall of 1962 to work on a master's in educational psychology. He received support as a teaching assistant to Professor Klausmeier. By the spring of 1964 he had completed the M.S. and expected to return to work in instrumental music. However, with the award of the initial grant for the Center, Woolpert had an opportunity to continue his studies in educational psychology, teach at the university level, and participate in Center research. The choice to stay at UW started his career in university administration.

Since he came to Madison, music has been an important avocation for Woolpert. He began by working with the Madison Boy Scouts Drum Corps in 1962 and was a cofounder of the CapitolAires All Girl Drum Corps in 1969. In 1976 he associated with the 1st Brigade Band as a musician and accepted the position of Bandmaster in 1982. The 1st

Brigade is a living history portrayal of a Civil War Union field band using antique instruments to play brass band music of the mid-nineteenth century. The Band has recently completed recording the fourth album of Civil War music under Woolpert's direction.

I was the first payrolled employee of the Center, starting mid-August 1964. I soon became involved in administrative activity. When Co-director for Administration Max Goodson was employed in 1965, I began working with him on budgets and other financial matters. This orientation toward business management and administration continued throughout my work at the Center.

I first became involved in administrative activity when the Center needed specialized audiovisual equipment to support research activities. The work of the Center was sufficiently different from typical activity that variances from standard state or University purchasing practices were required. One of the first justifications I prepared was to override the "Buy American" clause in our federal grant in order to acquire German Uher tape recorders that were uniquely suited to the data collection and stringent A/V presentation requirements of the Center's widespread classroom research.

Shortly thereafter a long struggle began with the state of Wisconsin regarding the duplicating equipment the Center would be allowed to acquire. I made the case that the classroom research and educational product development carried on by the Center required a level of duplicating responsiveness that was unavailable in campus and state duplicating facilities. The end result of many justifications and confrontations is the Center's Copy Shop which has been the most responsive on campus for many years.

As the scope of the Center's work increased, its service operations, including the Business Office, began to take shape. The Business Office was established with myself as director, Evelyn Dick as an assistant, Jerry Grossman as accountant, and Cheryle Teasdale as secretary. The supply room was set up. The copy/mail shop acquired new equipment and full-time personnel. At about that time the first electronic calculators were acquired to assist in fiscal management.

In 1972 when NIE assumed responsibility for the R & D Centers and the regional educational laboratories, it became clear that a different set of expectations regarding fiscal accountability would be applied; expectations that were, in fact, oriented more toward free-standing laboratories than toward university-based centers. Until that time the Wisconsin Center's funding had been institutional; i.e., the grant carried, as a direct cost item, funds for Center administration and operation. The new requirements dictated a programmatic accounting system that was capable of allocating administrative costs to projects.

In December of 1972 the Center reallocated administrative duties so that I could turn my attention toward the development of an internal accounting system that would provide the information required by NIE to fund Center programs

on a direct cost plus overhead basis. Jack Wende was employed as a programmer, and Evelyn Dick was assigned to assist with data acquisition and management. We worked for about a year conceptualizing coding schemes and generating computer programs that took the form of a Management Information System (MIS). During the years of its use, the MIS permeated the operation of the Center. It provided the accountability and credibility that was needed to satisfy federal concerns and was also a useful tool for Center management in the planning and monitoring of the Center's program. Perhaps the most productive benefit from MIS was the establishment of an internal overhead rate for the Center which has, over the years, contributed significantly to the flexibility and stability of the Center's fiscal operation.

One of the most important functions of the Business Office pertained to housing the Center and securing research equipment. The Center's first academic year was spent in Room 60 in the basement of the Education Building. We had about eight desks, separated by file cabinets and bookshelves, that were used by academic staff, clerical staff and graduate students. There were no facilities for professors who headed the research projects.

During the summer of 1965 we moved to a building located at 2200 University Avenue that had previously been a grocery store. There was a substantial amount of open space which was cut into sections with portable office dividers for the academic, clerical, and graduate student staff. The rear portion of the building provided three or four offices for the Co-Directors and professors and a larger space that we used as a conference room. This building was about one and one-half miles from the Education Building.

Increases in funding added more staff than the University Avenue building could house. In 1967, the Center moved to a private dormitory at 1440 Regent Street. We occupied all of the second floor and part of the third, with additional storage space in the basement. The suites, consisting of two bedrooms, a living room, a kitchen and bath were converted to offices. Two suites were remodeled to serve as conference areas. The Center was now within about a mile of the Education Building.

Planning for a new education building had been in progress since the early 1960s. By mid-decade it had worked toward the top of the University/State priority list. The federal legislation (PL 89-10) that would eventually fund Education Sciences Unit 1 made its way through Congress. The first discussions regarding the possibility of federal funding for a permanent facility for the Center occurred in late 1966. It soon became apparent to University/State officials that major facility funding might be available. The USOE took the position that the facility should be shared and the University agreed to the concept. It was agreed that federal funding would support the "Invited Program" (the Center) at 100% and "other" educational R & D programs (faculty research, multimedia lab, etc.) at 33%. Instructional space would be supported 100% with state funds.

Early in the planning process Professor Klausmeier had me added to the School of Education Facility Committee, chaired by Prof. Robert Petzold, Associate Dean of the School of Education. My responsibility was for the federal portion of the building; Marvin Fruth was added to work with the State portion. Unfortunately, USOE had no guidelines specifying the content and format of a facility proposal. I coordinated the details of the proposal documents, working between USOE, University and State officials, and Center Staff.

The proposal was submitted in late 1967. A planning grant ($109,074) to cover initial architectural work by Durrant, Deininger, Dommer, Kramer and Gordon was awarded in May of 1968 and later amended to include the work of two special consulting firms recommended by the USOE–Information Systems Architectonics to assist with planning for equipment and technology ($105,000) and Davis, MacConnell and Ralston to work with functional relationships ($30,000). The construction grant of $3,982,218 was awarded in June 1969, bringing the federal total to $4,226,792. State funding was budgeted at $4,036,694 for the building, furniture, and equipment.

The Center and three instructional departments moved into ESU 1 in Fall 1972. The building included several specialized facilities and features for the Center:

1. Office modules in three sizes centered around common work areas.
2. Special walls that could be moved more easily than typical University building walls to accommodate the changing structure of Center programs.
3. A cable chase running the entire height of the building and "sandwich" room walls facilitating the interconnection of communication, computer and video lines.
4. A laboratory complex that included classroom, large-group, small-group, and individual research areas.
5. A conference area centered around AV presentation facilities with one room divisible into three sections.
6. A computer area, a media area, and a research materials area.
7. A duplicating shop and a materials assembly/mailing/shipping and document storage area.
8. A darkroom/photo facility.
9. A garage for a research van and Mechanical and Electronics Shops.
10. Specialized office complexes for the Center Director and for Business Operations.

From 1971 to 1974, I was involved in procuring about $1 million of specialized research equipment. With this equipment, the Center became one of the best R & D facilities in the U.S. Moreover, it was near the center of the campus.

Throughout my tenure with the Center, the Business Office was responsible for daily operations, facility management, contract/grant negotiation and compliance, and purchasing and subcontracting. The success of the business operation was largely due to the capability and creativity of the individuals who dedicated themselves, over extended periods of time, to this particular support activity: Evelyn Dick, Jerry Grossman, Cheryle Teasdale, Sandy Treptow, the late Bonnie Amim, Gwen Goplin, Maureen Ormson, and Greg Crews. Five of these able people were still with the Center in 1989–90.

Mary R. Quilling

Director, Technical Section

With WCER 1966–75

Program Director, Advanced Technology Inc.

Mary Quilling received her Ph.D. in Educational Psychology from the University of Wisconsin in 1973, when she was appointed Associate Professor of Education at the University of Massachusetts. There she pursued her interests in evaluation and collaborative school relations, evaluating many of the University's innovative programs and teaching staff members on-site at Boston's English High School under Judge Garrity's desegregation orders. She moved to the Northwest Regional Educational Laboratory in 1979 to become a senior staff member of the Chapter 1 Technical Assistance Center (TAC). Involved with the Chapter 1 TAC now for 11 years, Mary is project director of the Region B TAC serving the Mideast and industrial Midwest, and program director of Advanced Technology's Educational Improvement and Evaluation directorate. In the latter capacity she has oversight responsibility for the two new rural TACs serving the Southeast as well as the same states served by the Region B TAC. Her field work takes her primarily to major urban school districts, including Philadelphia, Baltimore, Washington, DC, Cleveland, Cincinnati, and Louisville. Located in Indianapolis, she also conducts desegregation studies in the local schools.

When the Center started operating in 1964, there was an acute shortage of experienced educational researchers. Experimental design and multivariate analysis were terms seldom found in the educational research literature. Too, educational product development was in its infancy. Despite these conditions, the Center moved ahead rapidly both in classroom research and in product develop-

ment. As was shown in chapter 1, by 1968 there were 15 research projects and several development projects.

The Center's Technical Section was created in 1968 to provide support to each of the research and development projects. Initially the section was staffed with individuals with classical training in statistics, experimental design, measurement, and computer applications, with me as the director. We provided assistance to principal investigators and project assistants in completing statistical analyses, in writing technical reports and in developing tests and other instruments. Certain services were centralized in the Section, too, including test scoring, keypunching, and setting up computer runs on the University's mainframe computer. The Section's most famous alumnus, Prof. Ed Haertel of Stanford University, began his illustrious career in his junior year as our computer "runner," and quickly became a proficient statistical consultant, being one of the first people in the country to master Finn's Multivariate Statistical Package. The Section also conducted a technical review of most Center documents.

Our methodology assistance was soon augmented by applications of emerging instructional technology. Mager's approach to behavioral objectives and Glaser's concept of criterion-referenced tests were applied by the Section as our staff began to work with the projects developing instructional systems. Dr. Margaret (Peg) Harris headed the group working on the development of the criterion-referenced tests to accompany the *Wisconsin Design for Reading Skill Development*. As the curriculum products were readied for field tests, Section staff planned and implemented both formative and summative evaluations of the materials. Field testing often involved designing missing pieces of the product, such as teacher in-service materials, or negotiating with the project to adapt the product to meet school expectations.

Potential field test participants were identified, teacher training provided, and implementation monitored. The field test managers provided much detailed information to the projects, and the field test findings were summarized in technical reports. The Section carried out three national field tests in cooperation with project staff: *Patterns in Arithmetic, Wisconsin Design for Reading Skill Development*, and Individually Guided Education in the Multiunit School. We were particularly successful in engaging urban schools in our field tests, not only in Wisconsin, but also in Chicago and New York. The many contacts that the Section developed with schools led to our being assigned the responsibility for school relations for a period of time. Dr. Juanita Sorenson took major responsibility here. We found sites for experiments with children, managed the initial contacts, and resolved any problems. And problems there were. Graduate students were sometimes inflexible when a school function such as vision screening interfered with their data collection, and they did not always dress appropriately for school visitation. (For a period of time I was charged with inspecting the dress and footwear of students before they were given the keys to a state car.) But there were compensations, such as being involved in conducting school visitations for high-level Soviet

educators on a cultural exchange visit. Also, Baldridge cited the Center as having effective school relationships in his study of the quality of the centers' and laboratories' work with schools.

As director I had a hand in many of these activities. I also participated weekly in meetings of the Management Team and in the annual program planning and external review meetings. Attending CEDaR meetings where product development and evaluation activities were described was also very stimulating. Since key people from the laboratories were also applying the new instructional technologies, I visited all the west coast laboratories to observe the development activities and discuss formative and summative evaluation procedures.

As the Section expanded to over 20 staff members one summer, some of the Section activities were spun off into separate sections. School relations was moved to the Dissemination Section. And the planning for the new building, including acquisition of computer hardware, called for a separate computer technology section. The refocusing of the Technical Section efforts on statistics, measurement, and evaluation kept the Section's tasks manageable.

Throughout my years at the Center, I maintained a strong interest in Individually Guided Education (IGE). As a graduate student, I had consulted in the design of the initial Project MODELS evaluations, visiting innercity schools for the first time. I continued to implement evaluation activities and report on them at meetings for Center review teams, Wisconsin Department of Public Instruction officials, and participating schools. I also worked closely with Dr. Klausmeier's staff to design and implement IGM experimental studies, the results of which show that children's behavior was markedly and positively affected by the interventions.

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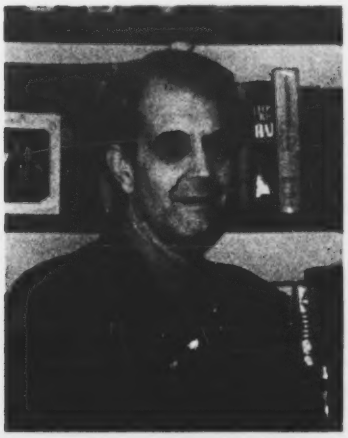
Stewart, D. M., Quilling, M. R., & Frayer, D. A. (1971). *Individual conferences to promote independent reading: A report of the field test* (Technical Report No. 185). Madison: Wisconsin Center for Education Research. (ED 070 071)



James E. Walter

Director, Dissemination Section

With WCER 1967–76

Associate Professor of Education (Administration)

University of Missouri-St. Louis

James E. Walter was awarded the Ph.D. in Educational Administration from UW-Madison in 1973. Prior to that he was an English teacher, an educational consultant with the Michigan Department of Education, and Director of Information Services at the Wisconsin R & D Center for Cognitive Learning. After earning the doctorate, he served as the Director of Dissemination at the Wisconsin R & D Center.

In 1976 he relocated to UM-St. Louis where he is an associate professor teaching in educational administration. Besides advising graduates for master's degrees and administrator certification, he is heavily involved with advising and directing dissertations for students earning the Ed.D. in Educational Leadership. During his tenure at UM-St. Louis, Dr. Walter initiated the development of a metropolitan teacher center, served as a court-appointed expert for the St. Louis desegregation case, and was a senior research associate for a national study of urban schools conducted by Dr. Francis Chase.

My interest in educational administration grew out of my involvement in the R & D Center's work on the multiunit organizational and administrative arrangements of Individually Guided Education and my association with Professor James Lipham, my major professor. The course work during the time I was earning the Ph.D. focused on organizational theory grounded in social psychology and sociology. My later work with the implementation of IGE stimulated an interest in change theory and in designing and conducting inservice activities for educational leaders in state education agencies, district offices, and teacher education institutions. That background provided the theoretical and applied perspective that guided my activities as Director of Dissemination. The staff of the dissemination unit at the R & D Center not only designed materials and activities

for inservice activities, but also helped educators in 23 states establish statewide IGE networks and four regional leadership institutes housed in universities. We developed an introductory film on IGE, "Think Kids," that is as current today as it was in 1975.

Reform movements today have much in common with IGE of the early 1970s. Among the reform efforts of the 1980s, I am most familiar with the work of the Holmes Group. Working groups of teachers, administrators and professors of educational administration echo many of the issues that we dealt with in the organizational-administrative aspects of IGE. Networking, team teaching, differentiated staffing, lead teachers, and the instructional role of the principal are just a few examples of the early IGE concepts that many "Professional Development" schools are dealing with. Former participants in the IGE implementation efforts are now serving in leadership capacities in the current reform efforts.

A number of possible reasons can be put forth to explain the extraordinary structures recommended in IGE and the current reform efforts. One perspective that my colleagues and I are currently using as a frame for research is predicated on an institutional analysis. In this view, schools are institutional organizations and as such are more likely to have structures that reflect the expectations of the extra-organizational environment as reflected in society at large. Our research, as well as that of our doctoral students, seems to indicate some validity for this explanation. In short, unless the structure of a school looks like what the general culture expects, other structural forms are not considered appropriate. Should this early analysis of the data hold up, it would suggest that an important part of educational reform is influencing cultural expectations for schools.

Selected Publications

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Walter, J. E. (1973). *The relationship of organizational structure to organizational adaptiveness in elementary schools* (Technical Report No. 276). Madison: Wisconsin Center for Education Research.

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Booker Gardner

Academic Staff

With WCER 1974–78

Principal, Van Hise Elementary School

Madison (WI) Metropolitan School District

Booker Gardner has been an elementary school principal since 1980, after serving two years as a curriculum coordinator in the Madison Metropolitan School District. He has a master's degree from Roosevelt University and a doctoral degree from Southwestern Illinois University. Gardner did postdoctoral work at the University of Wisconsin and had a Fullbright Fellowship to the University of Sierra Leone in 1985. He serves on a number of school district committees and is active in community organizations as well.

I first became affiliated with the Wisconsin R & D Center in 1971 while I was an assistant professor at the University of Illinois. Several schools in the Champaign/Urbana area were interested in learning more about the Individually Guided Education program that had been developed at the R & D Center. I was asked by one of the local elementary principals to attend an Awareness Session on IGE at her school. I found the IGE philosophy compatible with my own and began my introduction to the works of Dr. Herbert Klausmeier and his colleagues.

When Illinois joined the first group of states to be affiliated with the R & D Center, I was asked to serve on the IGE state council. For the next several months, I attended monthly meetings in Springfield, at other sites around the state, and in Madison, Wisconsin.

After helping to implement IGE schools in Illinois for two years I took a position on the Implementation Team at the Center, establishing IGE schools and state IGE networks nationally. During the next four years that I worked for the Center, I had the opportunity to work and travel in several cities and states throughout the country. I met and worked with some of the most innovative school people in the nation, from New York to California, and from New Hampshire to Texas. Even though I left the R & D Center more than ten years ago, I still maintain contacts with some of the people that I met during my tenure at the Center. In fact, while attending a National Science Teacher Associate

Principal's Institute, I met an IGE principal that I had worked with during my early years at the Center.

Traveling around the country as much as I did, I literally kept two suitcases packed and merely exchanged them when I came home for the weekend. Since my two children were very young and wanted souvenirs from every place that I visited, I managed to acquire T-shirts from major cities and college campuses across the country. I was even able to take my two-year-old son along on some trips to Florida and California, where he could visit his grandmother and other relatives while I was working in the area.

Travel with a two-year-old is filled with adventure. When we had a short stopover in Tampa en route to New Orleans we almost got left at the airport because he insisted on having a little stuffed animal that he had seen. The doors were closing and the plane was about to pull away from the ramp as we ran after it. Another time, I left my attache case in the Denver Airport after I had gone to buy my son some popcorn.

Working at the Center proved to be rewarding both personally and professionally. It was a unique learning environment with so many talented staff members and contacts made throughout the nation. Although I had some administrative and curriculum development experiences prior to coming to the Center, I learned far more about these subjects in my limited tenure at the Center than I had learned in both my college and university preparation plus my years of practical work experience. Working with writers, editors, and publishers added another dimension to my understanding of how curriculum products go from the idea stage to the fully developed and distributed stage.

After leaving the R & D Center in 1978, I took a position with the Madison Metropolitan School District as Curriculum Coordinator for Mathematics and Social Studies. In 1980, I was appointed to an elementary principalship and have served in that capacity since. I can honestly say that my years at the Center provided me with experiences that have helped me in many ways in the positions that I have held with the school district. I shall always look back fondly on the four years that I spent at the Wisconsin Research and Development Center.

Lois O'Brien Opalewski

Secretary to the Director, 1976–present

With WCER 1971-present

I began working at the Center in September 1971, after having been employed for two years as a department secretary in Textiles and Clothing, an academic department in the College of Agriculture on the UW campus. My first responsibilities were as secretary to the information officer and to the grants/contracts administrator for the Center; following that, I served as workshop coordinator in the implementation section of the Center, arranging for practitioner workshops for two of the Center's curriculum products, the *Wisconsin Design for Reading Skill Development* and *Individually Guided Motivation*. In 1976, I moved to the Director's office, where I have served as personal secretary/administrative assistant to a series of directors—Richard A. Rossmiller, Marshall S. Smith, Carl F. Kaestle, and currently Andrew C. Porter.

Because I was only 20 years old when I began working at the Center, I combine reflection of employment here with many of my personal life changes—benchmarks over time that included my marriage, birth of my son, and general growing and changing years. My friends at the Center have celebrated and enhanced my personal goals and accomplishments and aided and strengthened me during a few difficult times. My work with all of the directors has given me a sense of pride and accomplishment in what I've done. Although I'm obviously not an educator or a researcher, I'm proud of having served some of the very best in the nation. I consider the directors I've worked with to be special people in my life, and feel a sense of personal pride in my role during their tenures.

During the 18 years I have been with the Center, I have served as a classified staff member, joining more than a hundred other classified staff over the years, whose jobs comprise the "support services" areas of the Center—those who provide secretarial support for faculty, staff and graduate students; individuals who provide budgeting and personnel services, copy shop and mail room needs, and a variety of other types of assistance that helps the Center run smoothly in its day-to-day operations. I firmly believe that civil service employees are an important part of the Center and, furthermore, that the people filling those roles are both of an exceptional calibre and happy with their jobs and challenged by their responsibilities. Job satisfaction is particularly apparent, reflected by the length of time individuals have been employed here. The Center's "turnover" in the secretarial area, for example, is very low—many secretaries have been with the

Center for more than a decade; the same is true in other support staff areas. This is rare in an environment that continually offers "up and out" opportunities, such as those available to all classified staff who can choose to transfer to other state of Wisconsin jobs as they become available. Center civil service employees are a most dedicated and integral part of the system.

Periodically, I encounter former Center employees in grocery stores or at public gatherings. I haven't seen some of them for a decade or more, and there are always a few seconds of obvious attempt on their part and mine to remember names and place each other in the right context. Having done that, the individuals I've encountered usually begin to fill the gap in time by describing various jobs they've held since leaving the Center, ending up with the common question, "Where are you working now?" They consistently register surprise that I would still be working at a place they left long ago. I always tell them that I like working at the Center, that the constantly changing cast of characters in terms of individuals and projects has never become uninteresting to me—in fact, quite the opposite. It's truly a pleasure to have that opportunity to reaffirm my feelings about the Center to them and, more importantly, to myself.

The "Old Education Building," considered for razing in the early 1960s but later refurbished and now an admired historical landmark, provided the housing—two musty basement rooms—for the Wisconsin Center when it started operating in 1964.

7 Insights of the Deans of the School of Education

Deans head the colleges and schools of the University of Wisconsin-Madison. The deans report to the Chancellor of the Madison campus. The colleges and schools, including the School of Education, have instructional departments headed by chairpersons who report to the deans. There are also noninstructional departments—centers, institutes, laboratories, programs, and other organizations—headed by directors. The Wisconsin Center for Education Research is a noninstructional department of the School of Education.

As of 1954, the year Congress passed the Cooperative Research Act, the School of Education had one small Department of Education, a small Department of Art and Art Education, a laboratory school (Wisconsin High School), one noninstructional department (Educational Placement and Career Services), and a research budget of $8,000. As of 1989, the School had no Wisconsin High School (closed in 1964), a Department of Art, no Department of Education, but eight other instructional departments that grew out of it (Educational Psychology was the first to leave the Department of Education in 1961), eight research Centers (the first being the Wisconsin R & D Center for Learning and Re-Education and now the Wisconsin Center for Education Research), 13 noninstructional departments, and a research budget of $5.15 million. The 13 noninstructional departments

provide services and support to the nine instructional departments and the eight centers. Across the years from 1954 to 1989, the UW-Madison School of Education has developed into one of the largest in the country in terms of faculty and number of graduate programs, and it is one of the most productive university-based educational research organizations in the world. Each of the three deans who wrote this chapter played a key role in this development.

Each dean could well have written a book describing his leadership relative to research in the School of Education during his period of deanship. Recognizing this, I invited each dean to focus on a particular aspect: Lin Stiles (Dean, 1954–66) on his role in getting federal and state funding for educational research; Don McCarty (Dean, 1966–75) on the impact of the Wisconsin Center for Education Research on the undergraduate and graduate education programs of the School of Education; and John Palmer (Dean, 1975–present) on the importance of educational research to the School, UW, and the nation, the changing needs of educational researchers, and the availability of UW faculty and other support to the Wisconsin Center and the other research organizations in the School of Education. I suggested that mentioning areas of decision making relative to the Center and indicating satisfactions and frustrations relative to Center operations might be interesting and instructive. All of the ideas in the invitation were suggestions, not prescriptions. As might be expected of distinguished research-oriented deans, they had their materials to me earlier than did the contributors to any other chapter.

The UW-Madison has the nation's best school of education, according to a recent national survey.

The survey was conducted by Charles West, professor of educational psychology at the University of Illinois at Urbana-Champaign. He asked experts in eight sub-fields of education to rank the top 10 university departments in their specialties based on reputation or prestige.

West then combined departmental rankings from 232 specialists into an overall ranking. The top five education schools in his survey were UW-Madison, University of Illinois, Ohio State, Stanford and UCLA.

In departmental ratings, UW-Madison placed second in educational policy studies, third in secondary education, fourth in educational psychology, fifth in elementary and early childhood education, seventh in post-secondary education, ninth in special education and 18th in vocational and technical education.

Wisconsin Week, March 28, 1990

Lindley J. Stiles

Dean, 1955–66

Dr. Lindley J. Stiles served as Dean of the School of Education, University of Wisconsin, from 1955 through 1966. Prior to his Wisconsin experience, he was Dean of the School of Education at the University of Virginia for six years. He had previously served on the education faculties of the College of William and Mary, the University of Illinois, and the Ohio State University. Dr. Stiles left the deanship at Wisconsin to become the first Interdisciplinary Professor in the nation at Northwestern University. He retired from that post in 1979 and now lives in Boulder, Colorado.

Throughout his career, and especially during the time he served the University of Wisconsin, Dr. Stiles was a creative, inventive, and dynamic leader for the improvement of education. He was one of the few University administrators who continued his scholarly and research activities while, at the same time, performing ably as a dean. A Stiles Shelf in the University of Wisconsin Library Archives includes historical documentation of his leadership contributions to the state, the nation, and the world during his career in Wisconsin. On his retirement from Northwestern University, that institution created a Stiles Shelf of all his scholarly contributions as a model of an outstanding career in education. His autobiography, Cowboy in the Classroom, *was prepared to accompany the Northwestern Stiles Shelf.*

Dr. Stiles was awarded honorary doctoral degrees by Rider College, McKendree College, and the College of William and Mary. In 1962, the Air Force Association awarded him its prestigious Hoyt S. Vandenberg Award for his effort nationally to establish a research component for education. Of the twenty or more national and international reference books in which he was listed, one was unusual for a Dean of Education: Who's Who in Poetry. *Royalties from one volume of his poems,* Ideas and Images, *went to establish an annual award at the University of Wisconsin for the most outstanding prospective teacher. His "What Is Wisconsin" has been called a classic. It became the script for a color movie presentation about the University which is shown every year to entering students.*

The Wisconsin Research and Development Center is the bellwether of the emerging research component of education. For twenty-five years it has demonstrated how sustained scientific research on educational problems can produce better solutions than untested theories and advocated dogmas. History will record the full significance of the contributions of the R & D Center and others that have been patterned after this pioneer organization. As a background for the record that is being made in educational improvements by the R & D Cen-

ter, information about how the Center obtained its original financial base may be of use.

Soon after I became dean of the School of Education at the University of Wisconsin in 1955, I proposed that the University establish a program of research services for the schools of the state. The idea was to provide professors with time and resources to study the problems of schools, as had long been the practice with respect to problems of farms. The original budget request was a modest one—$25,000—as compared to the $2 million in state funds that the university was spending annually for research in agriculture. At a budget hearing to consider the proposal, I sought support from the dean of the Graduate School, the late Conrad Elvehjem, an internationally renowned research scholar in the field of bacteriology who later became President of the University. As I pressed for favorable action, Dr. Elvehjem deflated my efforts with this observation, "But, Lin, you don't need that kind of money to support research in the field of education. All that is required is a bookcase and some old musty books from which to quote." Elvehjem, of course was "telling it like it was." For half a century, efforts to improve education has been principally of the theory-to-practice variety. Theories that had been tested only through debate were the main guidelines to practice. Once adopted, a theory soon gained the force of dogma.

The Graduate Dean's painful characterization of educational research reminded me that a whole new image was needed of what educational research could be and what it could do to improve learning and teaching. The challenge was to change the pattern of "theory-to-practice" to one that involved a composite scientific system: "theory-research-development-practice." The ultimate model for such a system is the Research and Development Center at the University of Wisconsin-Madison.

Renewed efforts to obtain state support for education research, based on the analogy of agricultural research, were countered by President E. B. Fred with the explanation that the reason the School of Agriculture had state funds was the need to match federal grants. From that conversation on I realized that the route to state budget support for educational research led through Washington, DC. What I did not know then, but was soon to learn, was that, in order to get federal funds for educational research at the University of Wisconsin, I had to help obtain funds for all other institutions as well.

So, to find funding for educational research, I went to Washington—so many times I lost count. I learned how our Congress works and who its key members were, became acquainted with my own state Congresspeople, studied the branches of government through which funds could flow for educational research, and sought allies among fellow educators and other citizens who were interested in improving schools.

The first national efforts to establish a research component for education came with the passage, in 1954, of the Cooperative Research Act by the Congress

of the U.S. This legislation was developed under the leadership of Dr. Samuel Brownell, Commissioner of Education, and spearheaded through the Congress by the late Congressman John Fogarty of Rhode Island. In June 1956, it received its first appropriation, $1,020,190, of which $675,000 was earmarked for research on mental retardation, a special concern of Congressman Fogarty and a purpose for which public opinion could be motivated. The appropriation passed, I learned later from Congressman Fogarty, without any visible support from the education community. Interest in educational research was so low at that time, in fact, that officials of the U.S. Office of Education had to make personal appeals to deans of Schools of Education across the country to get them to persuade professors to develop research programs in this area. Four professors, including Dr. Herbert Klausmeier, who was later to become the designer and first director of the Wisconsin R & D Center, joined with me to write six of these proposals which were funded.

A million dollars was not much money, as governmental appropriations went, even in those times, but it was enough to attract the attention of bureaucrats in the Office of Education. Shortly after this appropriation was passed, I learned from Dr. Kenneth Little, vice president of the University of Wisconsin, who previously had been on loan to the U.S. Office of Education, that a move was under way in that Office to allocate research funds for personnel in the various departments instead of to research in universities and state departments of education across the country. Such action could be accomplished easily, inasmuch as Congress had placed the Cooperative Research Act funds in the personnel budget instead of providing a line item in the Office of Education budget.

I wrote immediately to Commissioner Lawrence Derthick (Brownell's successor) protesting the contemplated action and sent copies of my letter to a number of deans of education and chief state school officers whom I knew to be interested in the research program, urging them to make their views known to the commissioner. Many did. The expression of support for the research program led Commissioner Derthick to pledge that the appropriation for research would be protected. Nevertheless, this near loss of federal funds for research made me and others realize that more vigorous and widespread support from the field would be essential if the federal government's investment in educational research was to be expanded. Such feelings were reinforced. In the following year, 1959, after the appropriation had been doubled again to $2,000,000, I learned the federal budget makers were proposing to eliminate the appropriation for educational research entirely on the grounds that, as President Eisenhower put it, "Two million dollars is enough to solve all educational problems."

To save and expand appropriations for educational research, I led the first group of educators to testify before the House Subcommitttee on Appropriations in support of the Cooperative Research Budget. At his request, I assisted Congressman Melvin Laird from Wisconsin, Vice-Chairman of the House Subcommittee on Appropriations, write the legislation that gave appropriations for research

their own line item in the Office of Education budget. Because of presidential threats to discontinue appropriations for the Cooperative Research Program in October, 1960, I assembled a group of deans of education, drawn from representative public and nonpublic universities from different regions of the nation, to meet with Commissioner Derthick and Dr. Roy Hall, director of the Cooperative Research Program, to chart a direction for the federal funding of educational research. At this historic meeting, we agreed that substantially larger appropriations for educational research should be sought by direct approaches to the Congress. To facilitate the effort, I volunteered to serve as coordinator of ideas and information and to organize contacts with congressional committees. Beginning with the names supplied by this small group of educational leaders, I organized what came to be known as the Volunteers for Educational Research, which included over 850 workers for educational research representing government, defense (the Air Force Association, particularly), business, scientific, and lay groups as well as those in education. The efforts gained strength from our politically experienced colleagues from other fields who knew how to get action in the legislative halls.

When President Eisenhower proposed to discontinue the $2 million budgeted for the Cooperative Research Program, the Volunteers were able to persuade the Congress to increase the amount to $4.5 million. Within a decade, the federal budget for educational research and development increased to over $130 million. This level was a mere drop in the bucket, of course, compared to research investments in other fields, but it was sufficient to begin priming the pumps for research at local and state levels.

Wisconsin—its public schools, the state Department of Public Instruction, state colleges, as well as the university—set an example for other states in providing support for educational research. School systems began allocating funds and staff members to study their problems, often in cooperation with education professors and state department personnel. The state department, aided by funds from Title VI of the Elementary and Secondary Education Act, became oriented in its approach to leadership to improve schools. State support for educational research in the School of Education at the University increased substantially as federal contracts for research were negotiated and grants from foundations and business and industry were augmented. When the Wisconsin High School was discontinued because it was no longer being used for student teaching, its budget of almost a million dollars was earmarked for research to improve learning and teaching. Over all, by the time I resigned the deanship of the School of Education in 1966, the school's budget had increased over 600%, three-fourths of which was allocated to research and development activities. About 20% of the funds budgeted for educational R & D came from the legislative appropriations, the remainder came from federal funds, grants from foundations, and cooperative school improvement partnerships (CERS) with school systems. The state's share of support for educational research was increased later, when officials of the University were made aware that its contributions to educational research were too low.

Expanded research activities required additional staff members and research facilities. (The bookcase conception of educational research was no longer held by anyone.) Before I relinquished the deanship, the University had approved, and given priority on its building list, two new buildings for the School of Education: one to house educational research; the other, for the teacher education program.

A number of pieces of key federal legislation were proposed and passed as a result of the work of the Volunteers. The Elementary and Secondary Education Act, passed in 1965, included the Cooperative Research Program as Title IV. It contained provisions for support of the Research and Development Centers, of which the Wisconsin Center was a pioneer model. Legislation, supported by the Volunteers, established the National Institute of Education, which gave expansion to the goals of the Cooperative Research Program. The idea was to give to education a program of research and development similar in function and support to the Institutes' very successful program in the field of health.

When I left the University of Wisconsin, its School of Education had come to be recognized as the number one research School of Education in the world. I believe it continues to merit this distinction. A major factor in the achievement of this high reputation has been the contribution of the Research and Development Center. I reflect, with pride, that I was fortunate enough to be able to help with its creation.

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Donald J. McCarty

Dean, 1966–75

Donald J. McCarty received his B.S. cum laude from Columbia in 1949; his M.A. (1950) is from Teachers College, Columbia, and his Ph.D. (1959) is from the University of Chicago. He served as a secondary school teacher in New Jersey and South Dakota (1950–53) and was superintendent of schools in Colman, South Dakota (1954–56). During his graduate school years (1956–59) he served as a staff associate in the Midwest Administration Center at the University of Chicago. He spent seven years as a professor of educational administration at Cornell University (1959–66) and came to Wisconsin in 1966 as dean of the School of Education. In 1975 he returned to the Department of Educational Administration where he is professor of educational administration.

When I arrived on the scene at Wisconsin in October, 1966, from a professorship in educational administration at Cornell University, I was eagerly awaiting the opportunity to work with the Wisconsin Center for Education Research. The School of Education at the University of Wisconsin-Madison had the reputation then, as it does now, for excellence in educational research. Moreover, the University of Wisconsin-Madison itself had an international reputation for distinguished scholarship; it was also famous for its commitment (the Wisconsin Idea) to disseminating the fruits of its inquiry. I came to Wisconsin because I believed it was a class institution with heart. I was not to be disappointed.

It was immediately apparent to me after studying the reports and documents concerning the Wisconsin Center for Education Research (WCER) that it was intellectually well integrated with the University proper. Professors from many departments across campus were on the professional staff; in fact, I was surprised and delighted to learn that any professor who taught a course leading to teacher certification (this meant content courses in subject matter disciplines) was automatically a member of the faculty of the School of Education. True, this practice was partially symbolic (few professors from other colleges came to School of Education faculty meetings), but its message was powerful. The School of Education was perceived as an equal among equals, a rather uncommon finding for colleges of education among universities of the first class in the 1960s.

I was pleased to learn that the professors from the School of Education who affiliated with the Center were among the very best researchers we had. Many came from the Departments of Curriculum and Instruction, Educational Psychology, and Educational Policy Studies, where their research findings were immediately adapted to the undergraduate teacher training program. While this positive happening may have been unintended, it was a great boon to the School. Program change was not enforced; it came naturally as a product of each professor's research. The ideal of researcher as teacher had become a reality.

Another influence that I noticed was the beneficial effect the Center had on our graduate programs. The research activities supported by the Center prompted the selection of outstanding graduate students from across the nation. Approximately twenty new graduate students affiliated with the Center each year. This infusion of talent enabled the School of Education to offer advanced courses that might otherwise have been impossible. More lasting, these bright students worked as peers with their professors on research projects, and they learned how to become researchers themselves by engaging in it with able mentors. Most of these graduate students have gone on to successful careers.

Faculty members who were fortunate enough to affiliate with the Center had the great advantage of working as a team; happily, they also had the resources to do it. The Center provided unusual opportunities to faculty for publication, travel to do research, partial release from teaching, graduate student support, and the like. There was also the assumption that this research support would be continuing over time and that research of a longer time horizon could be considered. The Center had strong institutional support from both the Chancellor of the Madison campus and the President of the UW System with good connections in Washington, DC.

For a person like myself, steeped in the applied field of educational administration, diffusion of research to the practitioner is important. Practitioners usually do not read technical research journals, simply because they do not see the connection to their daily struggles to improve their teaching and administration. The Wisconsin Center was committed to diffusion; it reached out to the schools with its findings, scheduled conferences to disseminate its research, organized networks to encourage implementation, and tested its ideas in the inner city as well as in suburban and rural settings. I am glad to say that as I travel to visit schools throughout Wisconsin today I invariably find innumerable practitioners who praise the work of the Center.

Deans of colleges at the University of Wisconsin-Madison recognize that their chief responsibility is to facilitate the efforts of faculty members in the expectation that highly motivated professors will strengthen the educational process. It is a healthy way of stimulating scholarly activity in a loosely coupled organization. I do not mean to diminish the influence of deans in initiating

entrepreneurial thrusts, in proposing academic reform, or in vetoing unwise faculty enterprises. These things happen and they are necessary. But like retiring Dean Hickman of our School of Business, I believe that shaping the activities of faculty members is like herding cats. Professors in our School of Education are antibureaucratic; they do not respond to orders from the top. The University of Wisconsin-Madison and its School of Education favor this self-directed posture.

Saying this is not to negate the role of academic deans in a faculty-driven institution. Collegial institutions have their bureaucratic, their political, and their symbolic side, and there is ample room for administrative initiative. I soon found out that the Center was involved in political entanglements with the state government, the federal government, and within the university itself.

My first participation in this political process began with the endless negotiations involved in building what is now the Educational Sciences building and in the hard annual bargaining with ever changing Washington bureaucrats over the Center's budget. I am ever grateful for the solid support I received from President Harrington and Chancellors Fleming and Young in these endeavors. Whenever I needed help, they were willing to intervene personally at critical junctures. Moreover, deans of the other colleges were cooperative. I never had a bad experience with my administrative superiors or my fellow deans in the nine years of my service as dean.

Ultimately, of course, every college has to rise or fall on its own capabilities. The Wisconsin Center was headed by co-directors when I assumed the deanship. Coming from an administrative background, I found that kind of arrangement questionable. Closer examination revealed that mixed messages were coming from the two co-directors, so I made the decision to appoint Professor Herbert Klausmeier as the sole director. It turned out to be the right move. Professor Klausmeier symbolized in his dogged determination and his commitment to excellence what the Center was all about. Without his kind of dedicated day-to-day leadership the Center may well have floundered. Most research and development centers did perish over the years, but the Wisconsin Center prospered and grew under the stimulation of its talented Director.

The Center was not without its critics within our own School of Education. There was an undercurrent of feeling among some of the faculty that the federal funds appropriated for the Center meant that other efforts to obtain federal support would not be successful. We already had our share, so to speak, and that circumstance precluded other alternatives. Surprisingly, many other federal ventures were successful, but the Center did suffer from these negative perceptions. Also, faculty members who did affiliate with the Center were receiving substantial benefits that were not enjoyed by most of their unaffiliated colleagues.

The Center came under close scrutiny every year. Federal officials demand quarterly reports and they visit regularly. Moreover, the cast of characters in Washington keeps changing and each monitoring group develops its own

initiatives. Surviving in this complex environment requires consummate skill. Professor Klausmeier had the knack for staying one step ahead of the Washington bureaucrats; our central administration willingly provided the necessary institutional support; and the high quality of the research output by faculty members enabled the Center to reach the preeminence it now holds in the educational community.

The School of Education is indeed fortunate to have a large pool of highly able professors/researchers who are interested in research administration. In 1972 Professor Klausmeier asked to be relieved so that he could concentrate on his research. I invited Professor Richard Rossmiller of the Department of Educational Administration to assume this task. He accepted and I left my post in February, 1975, knowing that the leadership of the Center was in capable hands.

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John R. Palmer

Dean, 1975–present

John Palmer received the Ed.D. from the University of Illinois at Urbana-Champaign in 1960. He served as Assistant and Associate Professor of Secondary Education and Associate Professor and Chair of History and Philosophy of Education at the University of Illinois 1960–66. He came to the University of Wisconsin-Madison in 1966 as Professor of Curriculum and Instruction and History and in 1970 was also appointed as Professor in the Department of Educational Policy Studies. He served as Associate Dean, 1972–75, and as Dean of the School of Education,

1975–present. His primary research interests are the teaching of history and the social sciences, the nature of historical knowledge, the relationship of schooling to society, and the nature of social and educational change.

By 1975 the Center was firmly established as an essential part of the School of Education and one of a small number of nationally significant research centers. Despite the enormous growth of the research enterprise in universities following World War II, by 1975 in the field of education no more than 30 universities could be cited as producing significant research on educational questions. This meant that the Wisconsin Center was a national resource as well.

Because the Center provided a very supportive environment for faculty research as well as support for graduate students, it was a distinct advantage for faculty to be a part of the Center staff. This had both negative and positive consequences. The Center's research agenda has changed over time but is always necessarily limited, by space if for no other reasons. Faculty not part of the Center occasionally grumbled about their situation, particularly when some individuals had continuous Center support for many years. Over time, however, there has been a substantial turnover of principal investigators.

While the Center was vital to the total research enterprise within the School, care was taken to avoid using the Center to limit departments, and the Graduate School provided resources to anyone wishing to conduct research. Working within the Ce[illegible] was and is only one option available to faculty. In the long run this probably has served to protect the Center from criticism and permitted it to adapt to changing conditions and funding realities.

During my tenure as dean the Center has been directed by a succession of very able individuals who made it unnecessary for me to get involved in the day-to-day operations of the unit. Professors Rossmiller, Otto, Smith, Kaestle, and Porter each were confronted by different challenges as the directives and policies of the federal government underwent continuous change. However, each of these individuals understood the importance of research activity to the school and the University and how the Center could contribute most effectively to the improvement of educational practice in Wisconsin and beyond.

While changing perspectives and personnel in the federal bureaucracy were a matter of continuing concern to Center directors and staff, a major change occurred in the early 1980s. At that point the single-source contract that had provided the major funds for the Center since its inception was discontinued. This forced a decision regarding the future of the Center. Should it be discontinued or reconceptualized? Given the importance of research to the School and the faculty, the decision to restructure rather than terminate was not a difficult one, but there were several possibilities. Clearly the role of the Director would change. Rather than directing a single grant composed of many projects, the Director would oversee a diverse set of projects, each of which would be directed

by one or more faculty principal investigators. Of course, the Director might also submit proposals to support his/her research activities.

This redefinition of the Center tended to open the Center to a greater diversity of research activities. While this has had positive aspects, it has required greater attention to mission. Does a research unit have greater impact if it focuses all activities on one or a few related problems, as was the case during the first 20 years of the Center's existence? Or is the Center more responsive to the complex problems of learning and schooling by following the interests of individual faculty and the many possible federal, state, and private funding sources? The restructured Center has taken the latter option, but that could certainly change in the future.

During the 1970s and 1980s at least two trends affected the Center and its work. The term "field-based research" came into general use and, while not a new notion, did characterize the growing belief that university researchers needed to pay greater attention to the perceived problems of teachers and administrators in designing their research projects. Center staff now work closely with school personnel in their research and rely heavily on critiques provided by practitioners.

The other trend, the need for more sophisticated research equipment, presented a difficult challenge for the School. The initial federal contract that provided major funding to build the facility that houses the Center included substantial monies for equipment. This was a common practice for federal agencies in the 1960s. That money was utilized very carefully and allocated over several years but eventually was reduced to zero. In the last few years, of course, the personal computer has become an essential research tool and, in some cases, other technology is needed to carry out particular grants; these purchases must be made from other sources. This problem, of course, is shared by the entire University as it struggles to maintain research facilities and provide up-to-date research equipment.

It had been my policy, and that of previous deans, never to hire a faculty member either using temporary research funds or solely to carry out research activities needed by a Center project. This has several benefits. The most obvious is that, when grants terminate, as they inevitably do, funds are available from the regular University budget to cover all faculty salaries. All the research conducted in the Center carries an involvement of and a commitment by continuing faculty. Perhaps most important, principal investigators in the Center, when they leave their Center assignments and return full time to their departments, are viewed as colleagues by other department members rather than as outsiders. I find that administrators at other universities assume we have hired many faculty on "soft" money. The fact is we have hired none. Thus, regardless of sudden changes in federal funding policies for educational research, the Center will not create budget problems for the School.

The Center continues to provide an unusually supportive environment for research. Investigators are provided excellent space, skilled support staff to handle budgets and the development of grant applications, expertise in where and how research funds can be obtained, and association with a cadre of scholars, each of whom is engaged in significant research.

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8 Epilogue

In the 1960s and early 1970s educational research was in its infancy. Researchers were struggling to clarify the differences between basic research and applied research (Cronbach & Suppes, 1969). Product development (Tyler, 1976, pp. 1-16) and program evaluation (Cronbach & Associates, 1980) were poorly understood, the subject of much discussion. The National Center for Educational Research and Development (1969, pp. 69-123) indicated that as of 1964 there was an acute shortage of educational researchers and that scarcely anyone had experience in directing large scale programmatic research, much less the new R & D organizations. Educational researchers and practitioners were not communicating with one another constructively. The outcomes of educational research were not getting into educational practice.

As of 1989 we no longer debate the meaning of basic research, applied research, development, and evaluation. The many negative conditions of the earlier years have been turned around. The Wisconsin Center has contributed greatly to this change. In the next pages I highlight the Center's major accomplishments. One set of accomplishments relates specifically to R, D, & I outcomes as presented in chapters 1-5. Others deal with personnel development, advancing educational R, D, & I nationally, and the institutionalization of an R, D, & I capability at the University of Wisconsin-Madison.

The record of accomplishments of the Center is more complete for 1964–85 than for 1985–89. As we saw in chapter 1, seven centers and 10 other major projects of WCER began on 12/1/85 or later. Only one of them was completed before 1990; most of the others were scheduled for completion between 6/30/90 and 12/31/90. Accordingly, final reports of accomplishments were not available. The Center published its most recent five-year summary of activities and a bibliography of publications for the period 1980–85 (Smith, 1985).

KNOWLEDGE GENERATION, SYNTHESIS, AND THEORY FORMULATION

Many Center researchers from 1964 through 1989 greatly extended knowledge regarding human learning and development, early childhood through adolescence. Others carried out research at the cutting edge of knowledge regarding classroom, school, and school district processes and structures. Studies of social policy examined federal, state, and local roles in education and the implementation of federal policy. The outcomes of this research took various forms. The original studies generated findings that contributed to cumulating bodies of knowledge. Other outcomes included summaries, syntheses, designs, models, and theories.

The enormous volume of research from 1964 to 1980 is reflected in 584 technical reports (original research studies), 96 theoretical papers (research summaries and conceptual frameworks), and 314 working papers (mostly pilot studies or rationales for starting research or development projects) (Smith, 1982). These publications were produced by the Center and provided the basic information for subsequent articles, books, and book chapters. The Center did not keep a record of the latter publications during this period, but there were many. Center researchers produced an even greater volume of research relative to the short time frame from 1980 through 1984, years when curricular development and implementation were no longer in progress. Three hundred thirty articles in refereed journals, books, and book chapters were published or were in press during this five-year period. Sixty-six Center publications were produced (Smith, 1985). This pattern of productivity continued after 1985.

Relative to publications, West and Hoerr (1978) conducted a survey of the two leading journals in the field of educational psychology, the *Journal of Educational Psychology* (between the years 1958 and 1977) and the *American Educational Research Journal* (between the years 1968 and 1977), to determine the most productive scholars in the field. Of all educational psychology researchers, Joel R. Levin was ranked second and Herbert J. Klausmeier was ranked fifth. No doubt a search of leading journals in other disciplines other years would find many other Center researchers among the most productive scholars in their fields.

Learning and Child Development

In the 1950s and early 1960s a small group of experimental psychologists in departments of psychology of major universities were the experts on learning. They conducted their experiments in introductory psychology courses and in animal laboratories. Studies of classical and operant conditioning following B. F. Skinner's paradigm were in vogue. The study of human thinking or of any mental processing of information was regarded as nonscientific. Teaching machines and programmed instructional materials emerged from this conception of learning and entered the schools on a widespread basis, kindergarten through college. In this same period of time, child psychologists nationwide were trying to determine how children's development was influenced by environmental conditions and how children's behaviors could be modified by applying operant conditioning principles. Behavior modification held a central position in child development courses.

From the opening of the Center in 1964, Center researchers with few exceptions took a cognitive approach in their studies of learning and development following the lead of Jerome Bruner and Jean Piaget. We were more interested in the mental operations within an organism's "black box" than in relating environmental inputs to overt behaviors. And, while drawing from the emerging cognitive psychology, our work in turn contributed significantly to its growth and refinement across the years, helping it to become the dominant psychology of the current era.

Chapter 3 samples some of the Center research on learning: Farley on the nature of the human mind and human motivation, Klausmeier on concept learning and development, Levin on cognition and memory processes, and Newmann on higher order thinking. To this we add Davis (1986) on creative problem solving. In chapter 4 Carpenter summarizes his seminal research on mathematical learning and Venezky on the learning of pre-reading skills. Chapter 3 provides a glimpse of the Center research on child development: Lawton's on early childhood development and mine on cognitive development across the school years. More recently the Center's work is far more extensive and focuses on language development and its relation to cognitive processes (e.g., Schreiber, 1987), metacognition (e.g., Yussen, 1985), and language development in children with communicative disorders (e.g., Donnellan, 1985). The departmental affiliations of the preceding researchers include English, linguistics, mathematics, computer science, educational psychology, and special education. All have contributed to a better understanding of the mental processes involved in learning various kinds of school-related content. The work of these and other Center researchers greatly extends our knowledge of mental processes and learning-to-learn strategies. It provides a starting point for current research in human learning and child development. Graduate and undergraduate courses in educational psychology, psychology, computer science, English, linguistics, mathematics, education, and special education draw on it.

Classroom Processes

When the Center focused on improving education through Individually Guided Education, Center personnel conducted research on the classroom variables that affect student progress in learning. There was a continuous interplay of knowledge-generating research and theory refinement. Outcomes of this research include a large body of urgently needed knowledge and robust instructional strategies, designs, and models (chapters 3, 4). Among these are an instructional design for teaching concepts (Klausmeier), designs for teaching mathematics (Romberg) and pre-reading skills (Venezky), and techniques for increasing the motivation of reluctant learners (Frayer). These designs and techniques are compatible with the global model of instructional programming for the individual student in which instructional objectives, content, activities, measurement techniques, and evaluation procedures are aligned (Klausmeier, chapter 2). Today, commercial curricular programs incorporate this instructional approach; however, they do not focus as sharply on the educational development of the individual student as we did.

Federal funding for curricular development and implementation ceased in 1976 and with it the Center accelerated its research on classroom processes. Researchers from 1980 onward gave much attention to the cognitive processes that students employ in learning various subject matters and that teachers engage in during interactive instruction. They directed attention to identifying and describing the processes as well as to finding ways of instructing children to use already identified learning-to-learn cognitive and metacognitive strategies. A few of the many interests of the Center researchers (chapters 2, 3, 4) are the following: children's and teachers' thought processes during interactive instruction (Peterson), students' communicative competence in instructional contexts (Louise Cherry Wilkinson), use of pictorial and mnemonic strategies in the classroom and in instructional materials (Levin), mathematical problem solving strategies of young learners (Carpenter), scientific inquiry and the teaching of mathematics (Romberg), and computers and cognitive science (A. C. Wilkinson, 1983). This kind of research will undoubtedly continue into the 1990s, not only because of its impact on improving education, but also because these and other Center researchers have developed reliable methods for studying thought processes and learning-to-learn strategies.

School and School District Processes

A school may be conceptualized as a social organization of adults with characteristics and behaviors and young persons with characteristics and behaviors. Classroom processes such as have been described are carried out to attain the educational goals of the schools. The attainment of the goals, however, is dependent in part on factors that the adults and students in the classrooms cannot

control. These factors include processes and structures beyond the classroom at the school and district levels and policies external to the school district. The external policies and practices include those of government—local, state, and federal—and of non-governmental social organizations—the family, church, teacher organizations, business, and others.

From 1965 onward, Center researchers (chapters 2, 3, 4) studied in depth the organization of teachers and students for instruction, administrative arrangements at the building and district levels, curriculum, home-school-community relations, and external support arrangements. The researchers did not limit their studies to understanding practices that were prevalent at a particular point in time. Rather, they focused on understanding school change and how to bring it about.

Relative to the organization for instruction, school administration, and planned change, the monumental contributions of Lipham (1983) merit attention. From 1972 to 1978 he and his successive teams of graduate students completed 20 studies in IGE schools located in many different states. These studies focused on the changeover to IGE, role expectations of IGE school personnel, leadership in IGE schools, shared decision making in IGE schools, and IGE and educational renewal. From 1978 to 1982 he and his teams did 13 studies of educational change, leadership, and decision making in 100 high schools across the nation that were engaged in improving their educational programs. Persons interested in teacher empowerment, local school autonomy, principal leadership, school and district office coupling, or means of changing the expectations and behaviors of school practitioners profit greatly from this research.

An alternative form of secondary schooling emerged during the 1970s independent of the Wisconsin Center. Educational leaders designed this kind of schooling for students who would otherwise likely drop out of conventional high schools. Larger school districts across the country established one or more of these low-enrollment alternative schools. Dropping out of school before high school graduation continues to be an acute national problem. By 1990, at the beginning of its fifth of five years of federal funding, the UW National Center on Effective Secondary Schools had produced and disseminated research findings that, when implemented, may well result in a substantial increase in high school graduation of academically "at-risk" students (Newmann and Wehlage, chapter 3).

Social Policy

Social policy assumes that social processes are identifiable and predictable. A second assumption is that purposive, informed intervention into social areas, including education, can move processes and outcomes in desired directions. Thus, research directed toward understanding social policies that in turn influence governmental and other policymakers can contribute to the improvement

of education. The Wisconsin Center established a program of policy research in 1980 that was continuing in 1989–90.

One outcome of the Center's policy research took the form of guidelines for the development of effective elementary schools and an indication of the federal, state, and local policies most likely to result in successful effective schooling programs (Smith, 1985). First, the school is the focus of change. Second, a building staff should focus on altering the conditions in their school in the way most likely to produce a productive school culture. Third, resources, especially time and technical assistance, must be provided by the school district to encourage and nurture collaboration. Fourth, an inverted pyramid approach to changing schools should be adopted. This approach maximizes local responsibility for school improvement while giving recognition to the legal responsibility of higher governmental levels. These four guidelines have much in common with the Metaplan for School Self-Improvement presented in chapter 2.

Clune (chapter 3) found legal intervention in education to have both advantages and disadvantages. He developed a model of policy implementation that argues for analyzing and evaluating social programs politically. In the case of school improvement programs, he proposes an institutional analysis that considers changes in patterns of authority, roles, communication, and culture at all levels in the implementation chain from, for example, legislatures to schools. Taking a somewhat different approach, Kaestle (chapter 6) is developing a social history of the American reading public over the period from 1880 to the present. He expects to find out more about how technology and culture have interacted to shape reading activities and whether print literacy has served to enhance cultural homogeneity or to maintain divergent subcultures and points of view. Marrett (chapter 3) is relating social policies to the education of minorities.

PRODUCT DEVELOPMENT

Center teams, with input from practitioners, developed five curricular/instructional programs: *Patterns in Arithmetic, Pre-Reading Skills, Wisconsin Design for Reading Skill Development, Developing Mathematical Processes,* and *Individually Guided Motivation.* With even more input from practitioners, we developed an alternative form of elementary schooling, IGE; the Wisconsin Program for the Renewal and Improvement of Secondary Education; and, based on these two programs, a Metaplan for School Improvement, Kg.-12. The last four of the curricular/instructional programs were developed to facilitate teachers' implementation of IGE practices; however, they could be used in any school and in fact were used in many more non-IGE than IGE schools. We also developed designs and materials for implementing IGE, the curricular/instructional programs, and the program for improving secondary schooling. The most extensive of these was the design of the five-phase IGE implementation strategy and the related state IGE network. Sophisticated methods for evaluating the preceding educational

products after they were in use were formulated as an integral aspect of the evaluation component of IGE.

Besides these products that have been discussed in earlier chapters, Center personnel formulated a development paradigm that involves creating the design of the product, developing the first version of the product, and then carrying on iterations of formative evaluation and revision followed by field testing and summative evaluation. By use of this paradigm we attempted to insure the product's usability and its effectiveness in terms of attaining its stated objectives. Practitioners worked with the Center researchers/developers from the time of creation of the design through summatively evaluating the product. Application of the paradigm necessarily took into account the type of product, budgetary constraints, and the time schedule for completing its development.

The creation of the design of a product is critical. Three important considerations relative to the creation of any product design are specifying the intended outcomes, the intended users, and the sites in which it will be used. Little to much research may be involved in these three operations. To illustrate, Center personnel and practitioners carried on much original research from 1965 to 1969 in creating the first version of IGE, whereas the design for improving secondary education eventuated in a few months in 1983 from a synthesis of research and interactions with practitioners (Klausmeier, chapter 2).

Creating a design for a curricular program proceeds in different ways with respect to determining the content. When knowledge of content is sketchy, a great deal of original research with the intended users is required, as is illustrated by the *Pre-Reading Skills Program* (Venezky, chapter 4). Carpenter (chapter 4) is conducting many studies while developing a program of *Cognitively Guided Instruction* for use in the primary schools. On the other hand, Romberg (chapter 4) surveyed the possible content of mathematics, identified what was relevant at the elementary school level, organized it in a mathematically coherent fashion, and then conducted some research on its learnability. Based on these activities, he created the design for *Developing Mathematical Processes*.

The Center was reasonably well funded to carry on development through 1976, thereby enabling Center personnel to carry out each phase of the development process systematically. The summative evaluations indicated that the intended outcomes were being attained, including higher student achievement. The curricular programs and other products were well received by practitioners. Today we hear of many shortcomings of basal textbook series. Some educational software for computer-assisted learning is in fact not educational, apparently not having been designed well nor having been tested before being marketed. Some school districts across the nation are continuing ineffective patterns of organization-administration, advising, and home-school-community relations while others are starting untested approaches. The deterrents to developing effective educational products are many and complex; however, the Center has demonstrated that its product development paradigm can be employed successfully. In this

regard, the high quality educational products already developed by the Center could be refined and revised at low cost. Many other urgently needed high quality products could be developed. Moreover, other R & D organizations potentially have strong development capabilities. A vast human resource that could improve education almost immediately by putting tested educational products into the hands of students, teachers, and school administrators is not being used.

PRODUCT IMPLEMENTATION

School personnel need assistance in implementing educational products properly in accordance with the developer's recommendations. The more novel or more comprehensive the product is, the more assistance is required. The Center received a small amount of federal funding for implementing *Patterns in Arithmetic* from 1965 to 1970, a substantial amount from 1971 to 1976 for IGE schooling and four curricular/instructional programs, and a small amount from 1980 to 1984 for the Wisconsin Program for the Renewal and Improvement of Secondary Education.

Center records show that many elementary schools across the nation used *Patterns in Arithmetic.* The records indicate that the *Wisconsin Design for Reading Skill Development, Developing Mathematical Processes, Pre-Reading Skills Program,* and *Individually Guided Motivation* were even more widely used in this country and abroad (see chapters 2 and 4). Undoubtedly, other schools not known to the Center used the programs. Moreover, the early non-commercial editions were not copyrighted and anyone could arrange for their duplication or publication—and this was encouraged until the Center was assured in 1972 of being able to develop the commercial editions. The exceptionally widespread use of the programs was due in part to the fact that they incorporated novel features that, in the late 1960s and early 1970s, had not yet been built into commercial programs.

We implemented the Wisconsin Program for the Renewal and Improvement of Secondary Education widely in Wisconsin but very little in other states. The nationwide implementation of IGE received by far the largest federal funding. This was supplemented by the IGE Teacher Education Project, funded by The Sears-Roebuck Foundation (Klausmeier, chapter 2). We developed a five-phase implementation strategy: awareness, commitment, changeover, refinement, and institutionalization. State education agencies employed this strategy with the schools of their states. Both the strategy and the selection of the state education agency to lead the statewide effort proved highly effective through the changeover phase. As of 1975, some 2000 elementary schools had changed to IGE. However, federal funding of the implementation to the Center ceased in December of 1975 and, with it, Center funding to the 23 state educational agencies. With the cessation, the 23 state IGE networks lessened the sorely needed technical assistance that they had been providing to the IGE schools of their respective states.

This lessening of assistance and the national back-to-basics movement and the local school budget crunch, both of which were gaining momentum in the mid-1970s, had a powerful negative effect on IGE refinement and institutionalization.

Despite the negative factors, a large-scale evaluation study directed by Romberg (1985) showed that about one-quarter of the IGE schools in 1977–78 were implementing most of the IGE practices; others were implementing fewer, some very few. In Phase II of the Romberg study, Ironside and Conaway concluded that some of the IGE schools that they studied were implementing most of the IGE practices. But more important, these evaluators regarded all of the IGE schools as no longer being traditional schools; all were implementing some of the IGE practices. Apparently, some of the IGE schools as of 1974–75 had discontinued some of the IGE practices by 1977–78. But IGE practices re-emerged. My survey (see chapter 2 for details) showed that IGE practices were being implemented in more elementary schools (not just prior or present IGE schools) nationwide in 1989 than in the late 1970s. This record of implementation across two decades is noteworthy in view of the fact that of the several widely acclaimed programs of individualization described by the National Schools Public Relations Association in 1971, only IGE remained strong in 1989.

IMPROVEMENT OF SCHOOLING

The Center staff carried on its R, D, & I activities to improve schooling. The criterion for determining improvement was that desired student outcomes were attained. The Center had relatively little funding to evaluate the effects of its R, D, & I projects on student outcomes after the schools started implementation. However, one summary of the several evaluations of IGE that had been conducted between 1967 and 1970 was reported in 1970 (see chapter 2 for reports of all IGE evaluations). The 1970 report showed positive findings, findings that were instrumental in USOE's selection of the multiunit organizational-administrative arrangements and the model of individual instructional programming for nationwide implementation. In 1976 a Center team identified 46 IGE evaluations that had been conducted from 1966–67 to 1975–76, mostly by non-Center personnel. These evaluations showed exceedingly favorable results of IGE in terms of attaining desired student outcomes, including positive self-concepts, self-responsibility for learning and conduct, independence in decision making, good interpersonal relationships, favorable attitudes toward schooling, and a desired level of achievement in various subject fields as measured by criterion-referenced and standardized tests. These results indicated that from 1967 to 1976 many students annually benefited from IGE schooling (nearly 1,000,000 children were enrolled in IGE schools in 1974–75).

In a large-scale IGE evaluation study directed by Romberg (1985), mean student achievement in mathematics and reading as measured by a standardized test in 1977–78 did not correlate significantly with the extent to which the par-

ticipating schools were implementing IGE practices. The evaluators stated that the standardized test that was administered, though the most valid available, did not adequately measure the objectives of the Center's mathematics and reading programs that the IGE schools were supposed to be implementing. Too, the evaluators indicated that, in retrospect, they would like to have summarized the achievements of the children of the individual schools. This would have enabled them to estimate the extent to which each school was attaining a desired level of achievement; the mean achievement across all schools, which was computed, did not permit this. Measures of the many other intended outcomes of IGE, such as those included in the 1976 summary, were not gotten in the Romberg study. Thus, we do not know the extent to which the IGE schools in 1977–78 were attaining the intended student outcomes. And there were no later evaluations. However, since more schools than ever before were implementing IGE practices in 1989, and since the desired student outcomes of IGE were attained widely from 1966 to 1975, we may assume that IGE schooling is an effective alternative to other approaches even though the term IGE may have lost some popularity. In this regard, many elementary schools across the nation that are currently IGE, or were in 1977–78, have been recognized as schools of excellence by the U.S. Department of Education.

The Center did not limit its improvement efforts to the elementary school level. Middle schools of many states changed to IGE from 1971 to 1976. By 1985 as many as one-third of all Wisconsin middle schools and some high schools were implementing the Wisconsin Program for the Renewal and Improvement of Secondary Education (WRISE). The secondary schools that participated in my two improvement-oriented research projects (see chapter 2) markedly improved their students' achievement, attendance, and attitudes toward schooling and reduced the discipline problems and the dropout rate. The majority of the many middle schools of Wisconsin that have been recognized across the years as schools of excellence by the U.S. Department of Education were implementing IGE or WRISE practices.

Although I have emphasized the use of student outcomes in assessing school improvement, staff morale and job satisfaction are not to be totally ignored. Here all three IGE evaluations of 1970, 1976, and 1976–78 and my secondary school research show the same result—high staff morale and job satisfaction. I attribute this mainly to the fact that IGE and WRISE involve teachers in educational decision making at both the building and district levels, plus the fact that the teachers and principals are convinced that their students are attaining many important outcomes that are not measured by standardized or criterion-referenced tests. These practitioners work hard and enjoy their work because their students learn well and behave decently.

The Wisconsin Center as of 1989 was continuing to try to improve secondary schooling through the National Center on Effective Secondary Schools, Mathematical Sciences Education Research Center, Effective Schools Center, and

several other large projects (see chapter 1). Although the final results were not yet in, the leaders of these centers and projects indicated that they were making remarkable progress in this direction, especially through their networks of affiliated secondary schools.

DEVELOPMENT OF A NATIONAL R, D, & I HUMAN RESOURCE

One hundred forty-one professors, over 550 graduate students, and about 150 non-tenure-track academic personnel, including Ph.D. research scientists and project associates, have carried out, or in 1989–90 were carrying out, the Center's work (see Appendix A for listings). The former graduate students who have maintained contact with the Center are located in 40 states and in 11 foreign countries.

In chapter 5, former graduate students informed us of their experiences while employed by the Center and indicated how these experiences contributed to their subsequent careers. I selected these former students to be representative, not knowing in advance of their experiences or their accomplishments except in the case of one who was my former advisee. There is every reason to believe that the other former graduate students, for example, Carl Bereiter, John Feldhusen, Tom Kratochwill, and Andy Porter, to name only a few, had equally fruitful experiences while at the Center. These former graduate students constitute a far greater pool of R, D, & I talent than existed nationwide in the mid-1960s. With their present competencies they could readily have staffed the 10 R & D centers that started in 1964 and 1965. Many of them have greater R, D, & I competence today than did we professors who carried on the Wisconsin Center's work from 1964 to 1980.

Many former graduate students did not affiliate with universities or research organizations; instead, they entered careers typical of those of other graduates of their departments. Some who earned doctorates in educational administration became school administrators. Some of the graduates from other departments, such as Rehabilitation Psychology and Special Education, Communicative Disorders, and Educational Psychology, entered private practice, school psychology, health service organizations, and similar fields. In these careers they are using some of the knowledge they gained during their Center years and are informed consumers of research pertinent to their fields.

The former graduate students and academic personnel may have increased their research and other skills more than the professors who affiliated with the Center. In the early years we professors were relatively naive with respect to conducting programmatic research, developing curricular materials, and getting the outcomes of the Center's R & D activities into use in the schools. We made progress, but it was arduous and sometimes circuitous rather than in a straight line. Today, UW professors who started as Center researchers are direct-

ing the four UW centers funded by the Office of Educational Research and Improvement as well as other large projects of the Wisconsin Center for Education Research. The present and former professors affiliated with the Wisconsin Center and the former graduate students could readily lead and staff all of the nation's OERI-funded research centers.

We now turn to educational leaders and school practitioners. From 1968 through 1976 hundreds of educational leaders in state education agencies, school district offices, and teacher education institutions participated in Center-led workshops pertaining to elementary and secondary school improvement. In turn, they conducted workshops and provided hands-on assistance to practitioners at the building level. These leaders and practitioners are widely located nationally, and there are many thousands of them. Many are carrying on improvement-oriented research in their schools and districts. They provide the core of the school personnel who are continuing to implement planned change such as is involved in effective schools programs.

I find it impossible to imagine the many ways in which these many IGE educational leaders and practitioners across the country, the Center professors and academic personnel, and the former graduate students have influenced, and are influencing, educational research, practice, and policy. While I have tried to identify their main accomplishments, I know that I have only scratched the surface; I may have missed many of the most important. To illustrate, Lee Sherman Dreyfus, in his closing remarks in chapter 4, told us that the Center's pioneering ITV program *Patterns in Arithmetic* directly contributed to the creation of the Corporation for Public Broadcasting, NPR, and PBS. I agree with Lee's closing statement: "In my opinion, there will never be a full accounting of the true impact of the R & D Center begun at the University of Wisconsin in Madison over twenty-five years ago."

STRENGTHENING THE FEDERAL R & D CENTERS PROGRAM[1]

In 1954 Congress passed the Cooperative Research Act. Under amendments to this Act, 10 university-based R & D centers started operating in either 1964 or 1965. In 1965 Congress amended the Cooperative Research Act as Title IV of the Elementary and Secondary Education Act. Under this authority twenty regional educational laboratories came into being in 1966 and 1967. Of the original R & D centers, 10 were being funded in 1968, nine in 1970, eight in 1972, and seven in 1975. Funding of the seven continued to December of 1985. Three other centers started after 1968 and were funded to December of 1985. Of the original laboratories, 20 were being funded in 1968, 15 in 1970, 11 in 1972, nine in 1974, and seven in 1975. Funding of these seven continued to December, 1985. From FY 85 onward there was open competition for being awarded a center or a laboratory, and funding was for a five-year period only. None of the then existing centers

and laboratories were funded except as they were able to compete successfully for a five-year center or laboratory.

The history of the federal R & D program from 1966 to 1975 is one of unfulfilled expectations and many failures as well as some successes. The Regional Educational Laboratories Program that started with high hopes of contributing to the elimination of poverty experienced many early failures as has been noted. The loss of funding for 13 of the 20 laboratories resulted from a combination of ineffective program management at the federal level, unwarranted budget cuts enacted by Congress, and lack of productivity of some of the organizations (Dershimer, 1976, pp. 83-108). The R & D Centers Program fared considerably better, in part because of the centers' greater productivity and their being located in universities that supported them.

Although seven of the initial 10 centers and only seven of the 20 laboratories survived from 1968 to 1975, funding of the remaining ones remained fairly constant despite the fact that the total R & D budget of NIE dropped from $135.8 million in FY73 to $65.0 million in FY74.[2] The support in thousands of dollars allocated by USOE/NIE for all seven existing laboratories, the seven existing R & D centers including the Wisconsin Center, and the Wisconsin Center separately for selected years follow. The amounts are for USOE/NIE support only, not other support that the centers and laboratories may have received from federal and other sources (NIE, pp. 41, 42).

	1968	1970	1972	1975
All laboratories	$14,645	$10,738	$13,696	$12,100
All centers	10,828	7,459	8,440	9,130
Wisconsin Center	1,688	1,298	1,803*	2,332

* Does not include $570,000 for IGE implementation from the Bureau for Education Professions Development and the National Center for Educational Communications.

The Wisconsin Center was supported throughout the difficult years and also thereafter. While receiving this support, the Center contributed greatly to the survival of the federal R & D program from 1968 to 1975. Of the 14 organizations surviving in 1975, the Center was among the topmost—not only in one of the areas of research, development, personnel training, implementation—but in all four. As one illustration, USOE in 1971 selected the Center's IGE program for nationwide implementation. The highly effective implementation from 1971 to 1975 made visible the payoff of federally supported R, D, & I to chief state school officers, school district officials, and Congressmen in the many districts where IGE was being implemented. Too, the outcomes from the Center's knowledge-generating research were exemplary and gained the respect of the educational research community throughout this country and abroad.

INSTITUTIONALIZATION OF A WISCONSIN CENTER FOR EDUCATION RESEARCH

As of 1989–90 the Wisconsin Center is continuing its national leadership. It is a major national R, D, & I resource, an irreplaceable human asset. It has become institutionalized as the primary educational research arm of the University of Wisconsin-Madison. Professors from throughout the University regularly affiliate with it. The School of Education and the University provide monetary and other support of many kinds. Federal agencies, foundations, and other organizations provide monetary support. The Center is located in a magnificent, well-equipped research facility, one of the most functional in the world. I am confident that the Center will celebrate its fiftieth anniversary in 2014 and that, in its second 25 years, it will have contributed far more to the betterment of schooling in Wisconsin and nationwide than we were able to accomplish in the first 25 years. It will have made a great leap forward in improving the education of all children, and especially children from poor and disadvantaged backgrounds.

Notes

1. Mason, W. S. (1983). *Two decades of experiences with educational R & D centers* (mimeographed paper). Mason directed the R & D Centers Program from 1964 to 1972 and was a senior staff member of NIE thereafter until he retired. I used his paper here and in chapter 1 as a source of background information.
2. Conrad Katzenmeyer of the U.S. Department of Education's Office of Educational Research and Improvement supplied this budget information.

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215

Appendixes

APPENDIX A
Personnel of the Center, 1964-1989

Faculty

The following list was developed from Center personnel files. It includes all persons appointed to the Center as UW-Madison tenure track faculty. Some affiliated faculty may not be listed because they chose to have support for staff rather than personal salary support.

Allen, Ronald R.
Allen, Vernon L.*
Apple, Michael W.
Baker, Frank B.
Benson, Wayne W.
Bentz, Karen D.
Bloch, Marianne
Blount, Nathan S.*
Bollinger, John G.
Bowles, B. Dean
Boyd, Robert D.
Brandt, Deborah
Brown, B. Bradford
Cain, Glen
Calfee, Robert C.
Carpenter, Thomas
Chapman, Robin
Clune, William H.
Collis, Kevin
Conrad, Clifton
Czajkowski, Theodore J.
Danner, Frederick W.
Davidson, Robert E.
Davis, Gary A.
Davis, William J.*
Dennis, Jack S.
Devault, M. Vere
Dickson, W. Patrick
Donnellan, Anne M.
Dreyfus, Lee Sherman
Elliott, Stephen N.
Ellsworth, Elizabeth
Epstein, William
Farley, Frank H.
Fennema, Elizabeth
Finley, Fred
Fletcher, Harold J.
Fowlkes, John G.*
French, Doran C.
Frohreich, Lloyd E.
Fruth, Marvin J.
Gaddy, Gary D.
Gale, Calvin W.
Gamoran, Adam
Gleason, Gerald T.
Glenberg, Arthur M.
Gomez, Mary L.
Goodluck, Helen
Goodson, Max R.*
Grant, Carl A.
Gumpert, Gary
Hagstrom, Warren O.
Hallinan, Maureen G.
Hansen, W. Lee
Harris, Chester W.
Harvey, John G.
Haynes, Rayfield C.
Hewes, Dean
Hewson, Peter
Hoeh, James A.
Hollingsworth, J. Roger
Hooper, Frank H.
Hosler, Russell
Johnson, Dale D.
Kaestle, Carl
Klausmeier, Herbert J.
Knezevich, Stephen J.
Kratochwill, Thomas R.
Kreitlow, Burton W.
Lange, Donald N.
Lawton, Joseph T.
Lehrer, Richard

Levin, Joel R.
Lins, Joseph L.
Lipham, James M.*
Lockwood, Alan L.
Mare, Robert
Marrett, Cora B.
Massaro, Dominic W.
Maynard, Douglas
McCarty, Donald J.
McIsaac, Donald
Metz, Mary Haywood
Miller, Jon F.
Morrow, Richard G.
Nadler, Gerald
Newmann, Fred M.
Nystrand, Phillip M.
O'Hearn, George T.
Olneck, Michael R.
Otto, Wayne
Pearson, Paul
Pella, Milton O.
Peterson, Kent
Peterson, Penelope L.
Petzold, Robert G.
Pooley, Robert C.*
Popkewitz, Thomas S.
Porter, Andrew C.
Price, Gary G.
Read, William C.
Romberg, Thomas A.
Rossmiller, Richard A.
Ruiz, Richard
Schrag, Francis K.
Schreiber, Peter A.
Secada, Walter G.
Serlin, Ron C.
Shade, Barbara J.
Smith, Marshall S.
Sorensen, Aage B.
Spaights, Ernest
Spuck, Dennis H.
Staats, Arthur
Stampen, Jacob O.
Stanley, Julian
Stelmach, George E.
Steinberg, Laurence D.
Stewart, James H.
Streibel, Michael
Subkoviak, Michael
Swinton, Spencer
Tabachnick, B. Robert
Taeuber, Karl
Tarver, Sara
Van Engen, Henry
Venezky, Richard L.
Vief, Gisela
Voelker, Alan M.
Wallin, Bruce A.
Weaver, J. Fred
Wehlage, Gary G.
Westley, Bruce H.*
Wilder, Larry M.
Wilkinson, Alex
Wilkinson, Louise Cherry
Wolff, Peter
Young, I. Phillip
Yussen, Steven R.
Zeichner, Kenneth M.

Graduate Assistants

Drawn from Center Personnel File; a few persons who were graduate students and continued their Center affiliation afer earning a graduate degree are listed later with the Center academic personnel.

Accardi, Anna M.
Adams, Janice F.
Adetula, Lawal O.
Ahlgren, Charlotte P.
Albrecht, Barbara A.
Albuyeh, Ann H.
Allmendinger, Jutta
Amoroso, Henry C.
Anderson, Jacki L.
Anick, Constance M.
Ansell, Ellen S.
Antonacce, Gloria A.
Arntson, Paul H.
Artis, John B.
Askov, Warren H.
Atkinson, Michael L.
Atweh, William F.
Ayla, Ines
Bagheri-Majmi, Esmail
Baker, Jean A.
Baker, Susan
Bard, Jack JC
Barenklan, Keith E.
Barganz, Robert A.
Barger, Sharon A.
Bartels, Lois I.
Bauman, Mark A.
Bavry, James L.
Beach, Cheryl M.
Bebout, Harriet S.
Beeth, Michael
Belcher, Terence L.
Bender, Bruce G.
Bennett, Susan J.
Berends, Mark A.
Berg, Roger C.
Bernard, Michael E.
Berns, Carolyn
Biaggio, Angela M.
Bibler, Jill M.
Biggert, Robert Jr.
Billage, Denise B.
Billingsley, Keith R.
Blackburn, Judi L.
Blanchard, Linda Lee
Blohm, Paul J.
Blume, Glendon W.
Bocian, Barbara H.
Boerner, Charles D.
Boles, Ronald J.
Borgh, Karin M.
Bosben, Sandra J.
Bouri, Flesch D.
Bozeman, William C.

Bradford, Eva J.
Bradley, Margaret M.
Bragg, Barry W.
Braswell, James S.
Braverman, Marc T.
Bredeson, Paul V.
Brideau, Linda B.
Brittenham, Lee Roy
Broaden. Shirley M.
Bromall, Irvin H.
Brostrom, Paul E.
Brown, Diane L.
Brown, Joann
Brown, Marsha D.
Brown-Ott, Mary G.
Bull, Kay S.
Bulmash, Judith I.
Burke, Maurice J.
Burke, Ronald S.
Burt, Martha W.
Burton, Ramona
Busse, Randy
Butts, Priscilla G.
Cabrera, Alberto F.
Calais, Gerald J.
Calculator, Stephen N.
Camperell, Kaybeth
Carey, Deborah A.
Carey, Russell L.
Carnahan, Richard S., Jr.
Carrington Rotto, Pamela J.
Carvell, Robert L.
Chamness, Barbara
Chavarria, Silvia
Chen, Meichu
Chiang, Chi-Pang
Cho, Seehwa
Choe. Won Hyung
Choi, Sukyong
Church, Meredith
Cider, Mary E.
Citron, Michelle
Clark, Marsha J.
Cohen, Arie
Coley, Thomas
Comeaux, Michelle
Cone-Gorham, Patricia Ann
Connors, Jean
Coomber, James E.
Cooh, Perry
Cooper, Carin
Couture, Nanette
Cradle, Jay
Crais, Elizabeth R.
Dagnon, Carol L.
Dale, Michael W.
Damon-Moore, Helen M.
Dana, Carol M.
Dauer, Velma L.
Davies, Mary E.
Davis, J. Kent
Davis, Kenneth P.
Davis, Mary L.
Davis, Susan K.
Day, Randal D.
Day, Roger P.
Defrain, John D.
Demers, Ceclia A.
Demos, Elene
Dennard, Sarah H.
Densmore, Kathleen M.
Derose, Thomas M.
Dihoff, Roberta E.
Dilts, Barbara Suzanne
Divine, Albert L.
Dollaghan, Christine A.
Doro, Michael J.
Dretzke, Beverly J.
Dunham, Trudy C.
Dunstan, Jeffery F.
Durst, Anne R.
Dvorak, Thomas L.
Edwards, Evelyn N.
Edwards, Patricia A.
Eicher, Sue Ann
Eischens, Roger R.
Eldridge, Roger G., Jr.
Ellsworth, Patricia N.
Ershler, Joan L.
Espinosa-Dulanta, Miryam
Fadell, Elizabeth
Fang, Marcus C.
Fassbender, Lynette L.
Fast, Timothy N.
Feathers, Kay L.
Feezel, Jerry D.
Feldman, Katherine E.
Feldman, Robert S.
Fleming, Patrick J.
Fleury, Ann
Fogel, Daniel S.
Ford, Maty A.
Forrest, Renne E.
Fortier, Penny K.
Fosdick, Susan L.
Fotsch, Laverne P.
Frank, Arnold J.
Frederick, Edward R.
Freiheit, Susan G.
Gaa, John P.
Gallucci, Anita T.
Gargiulo, Richard M.
Gates, Harold
Gerasch, Johna C.
Germano, Mark C.
Geske, Terry G.
Ghaleb, Mohammed S.
Gillette, Maureen D.
Gillingham, Mark G.
Gilman, Pamela M.
Glotzer, Richard S.
Goldring, Susan
Gonchar, Arthur J.
Goodridge, Charles G.
Gore, Jennifer M.
Gorges, Todd
Goulden Marc E.
Graczyk, Mary J.
Gramenz, Gary W.
Grant, Jennifer
Grechesky, Robert N.
Green, Michael
Green, Richard A.
Grogg, Jeri (Walsh)
Gross, James F.
Gruen, Erica M.
Gustafson, David J.
Gutstein, Joyce J.
Guttman, Joseph
Hahn, Dae-Dong
Haines, Beth A.
Hansen, Ruth M.
Hanson, John O.
Hanson, Thomas L.
Harper, Betty J.
Harvey, Cynthia A.
Harvey Donald J.

Hassenpflug, Anna Marie
Hawkins, Gloria V.
Hawkins, Patricia L.
Heal, Frederick A.
Helgeson, Stanley L.
Hembree, Sheri
Hemmings, Annette B.
Hernandez-Nieto, Rafael A.
Hetterick, Kathe L.
Heibert, James
Holbrook, Mark L.
Holland, Karen
Holman, Richard C.
Holmquist, Albert M.
Holstein, Elizabeth A.
Horvat, Robert E.
Horvitz, James M.
Hougum, Craig L.
Houston, Camille M.
Houston, Tom R.
Howard, Judith A.
Hsia, Hower J.
Hua, Mau-Sun
Huang, Shih-Tseng
Hudak, Glenn M.
Hurlbut, Nancy L.
Hutchins, Edwin E.
Ibe, Karla J.
Ingram, John E., Jr.
Inzer, Eva A.
Jacobson, Jeffery D.
Jacobson, Joan M.
Jacobson, Kerry R.
Jameson, Phyllis A.
Janicki, Terence
Johnson, Helen M.
Johnson, Linda L.
Johnson, Shelby L.
Johnson, Todd
Johnson, Tom S.
Jones, Dorothy L.
Jones, Sandra J.
Junkerman, Karin
Kaczmarek, Nancy B.
Kamil, Michael L.
Kane, Partick T.
Kaplan, Sandra
Karbon, Jacqueline C.
Kasten, Katherine M.
Katz, Selena E. (Rhodes)
Kaufeld, Frederick J.
Kauten, Phyllis
Keirsey, David M.
Kemmerer, Joseph T., Jr.
Kennedy, Barbara J.
Kenworthy, Orville
Kerst, Stephen M.
Kertoy, Marilyn
Kessler, Jill B. (Berry)
Khaketla, Mamphono
Kilts, Barbara S.
Kim, Ki Seok
Kimelman, Mikael D.
King, Michael B.
Klais, Madge M.
Klausmeier, Thomas W.
Kloosterman, Peter W.
Klumb, Roger W.
Knapp, John V.
Koch, Elizabeth A.
Koehler, Marcy C.
Koenke, Karl R.
Kovacs, Julie
Kraemer, Elizabeth
Krupa, Walter E.
Kuhn, Robert C.
Kuhn, Robert N.
Kumar, Krishna V.
Ladwig, James
Lake, Roy Vincent
Lamal, Peter A.
Lamborn, Susie D.
Lamon, Susan J.
Lamphere, Barbara L.
Landsness, Ruthanne
Lane, Sherrill J.
Lantz, Margaret M.
Lavoie, Joseph C.
Lawrence, Brian I.
Lee, Bobbie Yuen-Hwa
Lee, Hyun-Girl
Leffin, Walter W.
Lehr, Judith
Lesko, Nancy
Leslie, Ronald C.
Levin, Kathy Brook
Levine, John M.
Liebig, Nelda F.
Liechty, Thorton A.
Lin, Wen Dar
Lipman, Pauline J.
Lisi, Peter W.
Lo, Anita Siu-Man
Loef, Megan M.
Lohr, Mary Jane
Lonsway, Alice E.
Lovejoy, Marcia A.
Lu, Priscilla Marilyn
Lubinski, Cheryl A.
Lucas, Sam
Lynch, Daniel O.
MacNeil, Teresa S.
MacRides, George A.
Maier, Michael J.
Majure, Ann
Makoid, Lois Ann
Manske, Mary E.
Marantz, Jane A.
Marinelli, Joseph J.
Marliave, Richard S.
Martin, Michael K.
Martin, Thomas J.
Mathews, Samuel R.
Maurer, Wanda S.
Mazor, Aviva
McBurney, Judith R.
McCabe, Ann E.
McCandless, Christine
McCarthy, Cameron R.
McCauley, Susan R.
McClellan, Hilary
McCormick, Christine B.
McGivern, Julie E.
McIntyre, Patrick J.
McNamara, James R.
Meise, Jon O.
Mekori, Oded
Melin, Marguerite A.
Mernitz, Scott
Mesaros, Richard A.
Meyer, Rochelle W.
Middendorf, Louise E.
Middleton, James
Miles, William R.

Miller, Betty
Miller, David J.
Miller, Gloria C.
Milosky, Linda
Min, Esther Suh
Miner, Paula C.
Minnis, Michele
Mirenda, Patricia L.
Mitchell, Carles E., Jr.
Mize, Gregory K.
Mizelle, Richard M.
Moore, Katherine A.
Moore, Mary S.
Morgan-Janty, Carol J.
Morris, Carl C.
Morrison, Charles R.
Moser, Richard H.
Moskoff, Mary P.
Mounts, Nina S.
Moyle, Colin R.
Mucciaroni, Gary A.
Mudrak, Louise V.
Murphy, Dennis J.
Murphy, Mary T.
Myrdal, Sigurjon
Nabate, Mohammad
Naeser, Margaret A.
Nauman, Craig J.
Negri-Shoultz, Nanette A.
Neiner, Glenn A.
Nelson, Barbara A.
Nelson, Charles A.
Nelson, Gordon K.
Nelson, Richard G.
Newtson, Darren L.
Nichols, Ransom B.
Nordahl, Kristina L.
Norton, Richard W.
Oinonen, Charlotte M.
Olsen, Lee F.
Olson, Craig C.
Onosko, Joseph J.
Osthoff, Eric
Paley, Dianne M.
Parrish, Gerald Lee
Patten, Wessel G.
Paul, Douglas A.
Perez, Carolyn H.
Peters, Jodi
Peters, Nathaniel A.
Peterson, Gary W.
Peterson, Joseph M.
Philipp, Mark
Philipp, Randolph A.
Pierce, Kim
Pierson, Eric H.
Pimm, David J.
Pizzillo, Carole M.
Plazewski, Joseph G.
Polisky, Beth L.
Portal-Foster, Charles
Porter, Betty C.
Potrykus, Julie
Powell, Frances A.
Probst, Daniel J.
Ramirez, Rebecca
Ramirez, Sylvia L.
Rampaul, Winston E.
Ramsay, James G.
Rankin, Robb
Raskas, Hillel I.
Rayburn, Jack L.
Rembold, Karen, L.
Remstad, Robert C.
Rhodes, Marilyn S.
Richardson, Bill
Richgels, Donald J.
Risley, Betty J.
Robinson, Pamela E.
Robinson, Precious
Roecks, Alan Lewis
Rosen, Stanley H.
Rosenberg, Frances M.
Rosenheck, Martin B.
Roth, Priscilla L.
Roth, Robert H.
Ruch, Michael D.
Rudegeair, Robert E.
Ruyter, Lyda A.
Saeman, Ruth A.
Samelian, John K.
Sanderson, Sharon K.
Sanocki, Thomas A.
Scherr, Nancy
Schilling, Joan M.
Schmuller, Joseph A.
Severin, Werner J.
Shapiro, Peter
Sheridan, Susan M.
Shire, Karen A.
Shoultz, Michael D.
Shriberg, Linda K.
Shulman, Karen R.
Simon, Sondra J.
Sinclair, Stephen L. R.
Sletten, Rennae, C. G.
Smith, Gregory A.
Smith, Kenneth B.
Smith, Kenneth M.
Smith, Paul C.
Smith, Richard J.
Smith, Stevens S.
Smithson, John
Smuckler, Nancy S.
Sorel, Susan M.
Speed, Noel E.
Spinelli, Francesca M.
Sprecher-Fisher, Susan K.
Spring, Deanna V.
Stallard, Cathy D.
Stark, Kevin D.
Stauss, Nyles G.
Stedman, Lawrence C.
Steffe, Leslie F.
Steinberg, Ruth M.
Stephens, Walter M.
Stern, Richard E.
Stevenson, Robert B.
Stoiber, Karen A.
Stolsmark, Richard L.
Stoltenberg, Suzanne K.
Stowe, Laurie A.
Straight, Anne
Stull, Charles A.
Sun, Shirley
Swanson, Naomi G.
Symonette, Hazel L.
Tait, Mary E.
Tendler, Dennis A.
Thaper, Bal K.
Thorley, N. Richard
Tichenor, James L.
Ting, Aichen
Tinsley, Katherine A.
Tolek, Nilgun
Tomlinson, Louise M.
Toms-Bronowski, Susan C.

Toniolo, Thomas A.
Toothaker, Larry E.
Towson, Shelagh M.
Train, Alice J.
Trezevant, Robert W.
Triezenberg, Henry J.
Triplett, Diana G.
Tropp, Margaret
Trujillo, Carla Mari
Truman, Diane L.
Tyree, Alexander K.
Urberg, Kathryn, A.
Utley, Cheryl A.
Valli, Linda R.
VanMondfrans, Adrian P.
Vereen, Mary A.
Verstegen, Deborah A.
Waas, Gregory A.
Wadden, Theresa M.
Waldron, Mark
Walia, Harriet J.
Walsh, Daniel J.
Wanska, Susan K.
Warren, Thomas F.
Watkins, Arthur N.
Watson, Michael
Wedekind, Cynthia A.
Weinstein, Melissa C.
Weisbeck, Linda
West, Sara F.
Whitaker, Donald R.
White, Paula A.
White, Steven J.
White, Wesley
Wilkie, Eve P. Battiste
Williams, Patricia A.
Williams, Richard
Williams, Steven R.
Wilsnack, Connie
Witte, Pauline L.
Wittwer, Franklin A.
Wivott, Suzanne N.
Wolf, Ann Nelson
Wright, Kenneth W.
Wu, Tsong-Shien
Yolas, Marguerite A.
Young, Mary P.
Zemke, Suzanne L.
Ziegler, Robert E.
Zimman, Richard N.
Zindler, Monica C.
Zivanovic, Milan
Zuniga, Cecilia

Academic Staff

Drawn from Center Personnel File. A few persons listed here were graduate students and became academic staff after being awarded a graduate degree.

Allen, James R.
Allen, Patricia S.
Anderson, Tom R.
Archbald, Douglas A.
Askov, Eunice N.
Barrows, Linda K.
Belt, Sidney L.
Bennett, Dan
Biagini, Joyce M.
Bilow, Charles R.
Blake, Mavis Theresa
Brady, Mary E.
Buchanan, Anne E.
Buschek, Pamela
Cavey, Robert
Chan, Nancy C.
Chandler, Arnold
Chester, Robert D.
Chicone, Susan K.
Compton, Carol
Connor, Ulla M.
Cook, Doris M.
Cooper, Zachary L.
Crews, Mary Beth
Curci, Richard
Dana, Marcia E.
Derein, Linda
Dick, Evelyn L.
Diluzio, Geneva J.
Douglas, Bruce G.
Dowding, Catherine A.
Eich, Diane Hammer
Evanson, Jacob T.
Evers, Nancy A.
Fadell, Elizabeth M.
Ferrer, Jami
Fischbach, Thomas J.
Folgert, Lorene
Frayer, Dorothy A.
Fredrick, Wayne C.
Fritz, Elaine D.
Gaddis, Marilyn
Gardner, Booker T.
Ghatala, Elizabeth S.
Gollop, Deirdre
Golub, Lester S.
Goodwin, William
Gratch, Janice S.
Greenstein, Janice Jipson
Grignon, Jerilyn
Grogan, William E.
Grossman, Jerome J.
Guckenberg, Thomas
Haertel, Edward H.
Harper, Richard M.
Harris, Margaret L.
Harritt, James R.
Heffernan, James John
Herrick, Helen
Hewson, Mariana
Houtman, Susan E.
Hubbard, Walter D.
Ingison, Linda J.
Iribarren, Norma C.
Jeter, Jan T.
Junker, Linda K.

Kamm, Karlyn R.
Kamm, Marga R.
Karges, Marjorie L.
Katzenmeyer, Conrad G.
Kavanagh, Rosemarie C.
Klenke, William H.
Klopp, Pamela M.
Koritzinsky, Katherine
Kouba, Vicky Lynn
Lamborn, Susie D.
Libby, Janet S.
Liebert, Dale M.
Lindquist, Robert E.
Lizana-Moss, Linda
Lockwood, Anne T.
Mancusi, Dennis F.
McGregor, Elaine
McLellan, Karen N.
McLeod, Douglas B.
McMurray, Nancy E.
Meyer, Vera Lea
Millar, Susan
Miller, Barbara
Miller, Emiline C.
Minke, Karl A.
Mond, David J.
Montgomery, Mary E.
Morrison, Beverly A.
Moser, James M.
Murdoch, Ellen Press
Neff, Joyce B.
Nelson, Nancy J.
Nelson, Owen N.
Nerenz, Ann G.
Owen, Stephen P.*
Padrutt, Jean M.
Parr, Robert H.
Peck, Betty C.
Perry, James H.
Pittelman, Susan D.
Powell, Margaret
Progan, Karen
Pressley, George M.
Pulliam, Mary K.
Purkey, Stewart C.
Quilling, Mary R.
Reischl, Cathy Hindman
Rendfrey, H. Kaye
Reynolds, Thomas H.
Roberts, Jay
Romaniuk, Jean
Romberg, Martha N.
Romstad, David A.
Ross, Rita T.
Rush, Leonard C.
Rutter, Robert A.
Saily, Mary
Sals, Diane K.
Schwenker, Judy A.
Seitz, Robert C.
Sell, Geraldine M.
Sewell, Natalie P.
Simpson, Kenneth J.
Sipple, Thomas S.
Sorenson, Juanita S.
Spangler, Chester W.
Spicer, Delano
Stevens, Sharon F.
Stewart, Deborah M.
Swing, Susan R.
Teicher, Barry J.
Thompson, Donald E.
Trepanier, Michele Louise
Trice, Gwennyth S.
Van Baricom, Virginia L.
Vandeventer, Herbert C., Jr.
Voci, Frank
Walker, William R.
Walter, James Ellsworth
Wamsley, Susan A.
Wearne, Diana C.
Webb, Norman L.
Weber, Lawrence J.
Winn, Aldonia C.
Woolpert, Danny G.
Zajano, Nancy C.
Zarinnia, Elizabeth A.

Classified Staff

Abplanalp, Sandra M.
Amim, Bonnie L.*
Ardelt, Doris M.
Argelander, Jennifer L.
Armstrong, Lisa L.
Benter, Elvira E.
Berkvam, Lavonne
Brown, Susan J.
Buechner, Diane
Clough, Pauline G.
Crews, Gregory J.
Cullen, Dorothy A.
Deau, Cynthia L.
Donnelly, Karen P.
Dykstra, Lois
Egener, Dorothy L.
Faust, Susan J.
Frailey, Teri J.
Fruth, Beverly B.
Glover, Betty
Goplin, Gwendolyn J.
Grayson, Marcia A.
Hall, Susan F.
Halverson, Catherine Maren
Helms, Beverly
Johnson, Sally T.
Klund, Judy L.
Knudsen, Arlene P.
Koshalek, Ethel A.
LaLuzerne, Susan M.
Lindemann, Barbara
Lindow, Janet A.
Lunde, Lynn A.
Maier, Dixie L.
Maly, M. Jayne
Markoff, Scott G.
McCoy, Rodney C.
McFee, John L.
McGinnis, Geraldine M.
McNitt, Carol A.
McQuade, Susan M.
Mecham, Kenneth R.
Middleton, Laura J.
Miller, Carol J.
Misa, Edward E.
Mitchell, Sylvia L.
Mlsna, Donna M.

Morrow, Joy
Moser, Mary K.
Norman, Jean A.
Opalewski, Lois O'Brien
Ormson, Maureen S.
Pacifico, Patricia A.
Podach, Marilyn J.
Pohlkamp, Julie A.
Polich, Kathleen J.
Quayle, Diane E.
Quigley, Madeline J.
Ranum, Diane J.*
Schultz, Kay M.
Schlutz, Susan J.
Schuster, John A.
Short, Janet
Sluga, Janice Lavinia
Smalley, Louise
Stroik, Majorie E.
Sullivan, Bonita
Teasdale, Cheryle L.
Tennis, Barbara C.
Treptow, Laura L.
Treptow, Sandra L.
Von Allmen, Jean
Watts, David K.

**deceased*

APPENDIX B
Graduate School Research Committee Grants to School of Education Faculty

The Graduate School Research Committee administers funds from the Wisconsin Alumni Research Foundation, holding an annual campus-wide competition. Funding priorities are to open new areas of research, to support research for which extramural funding is not yet available, and to assist new faculty in establishing research programs.

Fiscal Year Ending June 30	Funding	Fiscal Year Ending June 30	Funding
1951	$ 20,000	1974	$200,000
		1975	$240,000
1954	$ 25,000	1976	$170,000
		1977	$200,000
1960	$ 50,000	1978	$220,000
		1979	$260,000
1964	$ 60,000	1980	$260,032
1965	$ 60,000	1981	$400,000
1966	$ 75,000	1982	$400,000
1967	$ 90,000	1983	$300,000
1968	$150,000	1984	$300,000
1969	$130,000	1985	$500,000
1970	$141,649	1986	$600,000
1971	$130,000	1987	$400,000
1972	$150,000	1988	$400,000
1973	$175,000	1989	$476,043

Source: Graduate School Accounting Office.

Note: For 1954 and 1960, the budgeted amounts were reported. For 1970, 1980, and 1989, the amounts are actual expenditures. All other amounts are estimated from line graphs of research allotments to

five schools and colleges on the UW-Madison campus; graphs were provided by the Graduate School accounting office.

APPENDIX C
UW-Madison School of Education
Extramural Research Expenditures

Fiscal Year Ending June 30	Total Research Expenditures	Fiscal Year Ending June 30	Total Research Expenditures
1951	$2,792	1974	$4,192,432
		1975	$4,917,947
1954	$8,010	1976	$4,924,750
		1977	$4,505,470
1960	$479,144	1978	$3,884,912
		1979	$4,435,311
1964	$934,567	1980	$4,989,623
1965	$1,915,756	1981	$4,572,749
1966	$2,728,240	1982	$4,853,652
1967	$3,126,446	1983	$3,802,339
1968	$3,413,966	1984	$3,599,995
1969	$3,402,188	1985	$3,652,535
1970	$3,072,141	1986	$4,008,260
1971	$2,810,342	1987	$5,044,603
1972	$3,338,346	1988	$5,298,725
1973	$4,055,534	1989	$5,147,231

Source: University of Wisconsin Year End Financial Reports

Note: In the University's accounting system, income generated from the sale of, for example, print and audiovisual materials is treated as a reduction in expenditures. Thus, this summary of School of Education research expenditures under-represents total financial activity.

Graduate School research grants to faculty in the School of Education (Appendix B) when added to the amounts above, provide a more accurate picture of total School of Education research activity.

APPENDIX D
Center Books and Instructional/Implementation Materials

WCER used several techniques for getting printed and audiovisual materials published and distributed. The Center's copy shop duplicated and bound some material, including over 1,000 technical reports (original research studies), theoretical papers (literature reviews and theoretical formulations), and working papers (mostly pilot studies and feasibility studies); guidelines and other materials used in implementing the Center's educational products; and instructional materials and tests that schools used prior to the final publication of the materials. WCER sold some of these materials at cost and distributed others free. These materials are listed in successive Center bibliographies and most of them are available through ERIC.

WCER contracted with government and profit-making organizations, including film makers, to produce some books, films, filmstrips, and other materials. The Center's business office sold these materials at a price intended to recover the cost of production and mailing.

The Center entered into agreements with publishers to produce and sell some books, curricular/instructional programs, and implementation materials. Royalty was received under these agreements. Until 1981 half of the royalty was retained by the Center and half was assigned to USOE. After 1981 all royalty was retained by the Center.

Monies that the Center received from its sale of materials were placed in a revolving account and were used to support the Center's publication/distribution capability. Complete records are no longer available regarding the sale of all of the items. Royalty funds starting in 1966 were placed in UW trust accounts. One small account was expended for items for which state or federal monies were difficult to obtain. Starting in 1978 the continuing large account was drawn on to make small research grants to UW faculty. The grants were made primarily as seed money for subsequent extramurally funded research projects. As of 1989-90, 30 faculty members of the School of Education and 12 from other schools and colleges had received royalty-funded support. The grants totaled $350,000.

Curricular Products Generating Royalties ($696,810.99 revenue through 12/31/89)

Wisconsin Design for Reading Skill Development, Wayne Otto and others, Minneapolis: National Computer Systems. (After 1980, publication rights to the Design transferred to Learning Multi-Systems, Madison, Wisconsin.)

Developing Mathematical Processes, Thomas A. Romberg, John G. Harvey, James M. Moser, and Mary E. Montgomery, Chicago: Rand McNally, 1974-76. (Publication rights to DMP transferred to Delta Publications, Nashua, New Hampshire.)

Pre-Reading Skills Program, Richard Venezky and others, Chicago: Encyclopaedia Britannica. (PRS was translated into Spanish in 1978; publication of both the English and the Spanish editions ended in 1989.)

Books Generating Royalities ($49,961.57 revenue through 12/31/89)

Allen, Vernon L. (Ed.). (1976). *Children as teachers: Theory and research on tutoring.* New York: Academic Press.

Allen, Vernon L., & Levin, Joel. (Eds.). (1976). *Cognitive learning in children: Theories and strategies.* New York: Academic Press.

Carpenter, Thomas P., Moser, James M., & Romberg, Thomas A. (Eds.) (1982). *Addition and subtraction: A cognitive perspective.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Dickson, W. Patrick. (Ed.). (1981). *Children's oral communication skills.* New York: Academic Press.

Klausmeier, Herbert J. (1985). *A process guide to school improvement.* Lanham, MD: University Press of America.

Klausmeier, Herbert J. (1985). *Developing and institutionalizing a self-improvement capability: Structures and strategies of secondary schools.* Lanham, MD: University Press of America.

Klausmeier, Herbert J., & Allen, Patricia S. (1978). *Cognitive development of children and youth: A longitudinal study.* New York: Academic Press.

Klausmeier, Herbert J., and Associates. (1979). *Cognitive learning and development: Information-processing and Piagetian perspectives.* Cambridge, MA: Ballinger.

Klausmeier, Herbert J., Ghatala, Elizabeth S., & Frayer, Dorothy A. (1974). *Conceptual learning and development: A cognitive view.* New York: Academic Press.

Klausmeier, Herbert J., & Harris, Chester W. (Eds.). (1966). *Analyses of concept learning.* New York: Academic Press.

Klausmeier, Herbert J., Lipham, James M., & Daresh, John C. (1983). *The renewal and improvement of secondary education: Concepts and practices.* Lanham, MD: University Press of America.

Klausmeier, Herbert J., Rossmiller, Richard A., & Saily, Mary (Eds.). (1977). *Individually guided elementary education: Concepts and practices.* New York: Academic Press.

Klausmeier, Herbert J., & Sipple, Thomas S. (1980). *Learning and teaching concepts: A strategy for testing applications of theory.* New York: Academic Press.

Massaro, Dominic W., Taylor, Glen A., Venezky, Richard L., Jastrzembski, James E., & Lucas, Peter A. (1980). *Letter and word perception: Orthographic structure and visual processing in reading.* Amsterdam, Netherlands: North-Holland Publishing Company.

Otto, Wayne, & White, Sandra (Eds.). (1982). *Reading expository material.* New York: Academic Press.

Peterson, Penelope L., Wilkinson, Louise C., & Hallinan, Maureen T. (Eds.). (1984). *The social context of instruction: Group organization and group processes.* Orlando, FL: Academic Press.

Popkewitz, Thomas S., & Tabachnick, B. Robert (Eds.). (1981). *The study of schooling: Field based methodologies in educational research and evaluation.* New York: Praeger.

Popkewitz, Thomas S., Tabachnick, B. Robert, & Wehlage, Gary G. (1982). *The myth of educational reform: A study of school responses to a program of change.* Madison: University of Wisconsin Press.

Romberg, Thomas A. (Ed.). (1985). *Toward effective schooling: The IGE experience.* Lanham, MD: University Press of America.

Smith, Marshall S., & Purkey, Stewart C. Ends not means: Policy implications of effective schools research. In G. R. Austin, H. Garber, & S. P. Holowenzak (Eds.), *Research on exemplary schools: From theory to practice to policy.* New York: Academic Press.

Wilkinson, Alex C. (Ed.). (1983). *Classroom computers and cognitive sciences.* New York: Academic Press.

Wilkinson, Louise C. (Ed.). (1982). *Communicating in the classroom.* New York: Academic Press.

Wilkinson, Louise C., & Marrett, Cora B. (Eds.). (1985). *Gender influences in classroom interaction.* Orlando, FL: Academic Press.

Yussen, Steven R. (Ed.). (1985). *The growth of reflection in children.* Orlando, FL: Academic Press.

Instructional and Implementation Programs Distributed by the Center

Individually Guided Motivation, Herbert J. Klausmeier and others, Madison: Wisconsin Center for Education Research. (A textbook, a college instructor's guide, an implementation manual, two booklets, and five films.)

Wisconsin Program for the Renewal and Improvement of Secondary Education, Herbert J. Klausmeier, James M. Lipham, John Daresh, and others, Madison: Wisconsin Center for Education Research. (A textbook, an implementation book, 10 filmstrips and accompanying guides, and 9 school experiences audiocassettes and accompanying guides.)

Early IGE Implementation Materials, Herbert J. Klausmeier, Mary Quilling, Juanita Sorenson, Russell Way, George Glasrud, James E. Walter, Elaine McGregor. Madison: Wisconsin Center for Education Research. (An implementation guide, five sets of filmstrips and audiocassetts, fourteen transparencies, and a film.)

Later IGE Implementation Materials, Nancy Evers, Marvin Fruth, Walter Krupa, M. Lynn Karges, Dennis Mancusi, James Hefferman, and others. Madison: Wisconsin Center for Education Research. (An implementor's manual, outlines and materials for instructional leadership workshops, eleven simulations for IGE school operations, four simulations for prospective implementors, a performance objectives resource file, and three brochures.)

Nonroyalty Books and Monographs Distributed by the Center, 1964-1985

Harris, Margaret L., & Harris, Chester W. (1973). *A structure of concept attainment abilities* (Wisconsin Mongraph Series). Madison: Wisconsin Center for Education Research.

Harvey, John G., & Romberg, Thomas A. (Eds.). (1980). *Problem-solving studies in mathematics* (Wisconsin Monograph Series). Madison: Wisconsin Center for Education Research.

Klausmeier, Herbert J. (1985). *A process guide for school improvement.* Madison: Wisconsin Center for Education Research.

Klausmeier, Herbert J., & O'Hearn, George T. (Eds.). (1968). *Research and development toward the improvement of education.* Madison, WI: Dembar Educational Research Series.

Lipham, James, & Daresh, John. *Administrative and staff relationships in education: Research and practice in IGE schools.* Madison: Wisconsin Center for Education Research.

Lufler, Henry, & Kushner, Blanche. (1984). *Student rights and responsibilities: A handbook on school law in Wisconsin.* Madison: Wisconsin Center for Education Research.

Newmann, Fred M., & Sleeter, Christine. (Eds.). (1982). *Adolescent development and secondary schooling.* Madison: Wisconsin Center for Education Research.

Romberg, Thomas A., & Stewart, Deborah M. (Eds.). (1984). *School mathematics: Options for the 1990s. Proceedings of the conference.* Madison: Wisconsin Center for Education Research.

Rossmiller, Richard A., Geske, Terry G., Frohreich, Lloyd E., Doro, Michael, & Johnson, Helen W. *Resource utilization and productivity in IGE schools* (Wisconsin Monograph Series). Madison: Wisconsin Center for Education Research.

Sleeter, Christine. (1982). *Research in the 1980s on secondary education: A review and a projection.* Madison: Wisconsin Center for Education Research.

Wehlage, Gary G., & Stone, Calvin. (1982). *Effective programs for the marginal high school student: A report to the Wisconsin Governor's Employment and Training Office.* Madison: Wisconsin Center for Education Research.

Index

Names of the contributors to chapters 3-7 and the page numbers of their biographical notes, narratives, and selected publications are in boldface.

Accomplishments of Wisconsin Center, 1964-1989, summary of
  development of a national R, D, & I resource, 225-226
  improvement of schooling, 223-225
  institutionalization of the Center, 228
  knowledge generation and theory formulation, 216-220
  product development, 220-222
  product implementation, 222-223
  strengthening of federal R & D Centers Programs, 226-228
Ahlgren, H., 117
Air Force Association, 206
Albuyeh, A., 158-160
Allen, P. S., 48, 73, 80, 82, 135
Allen, V. L., 82, 91, 93, 153
Amim, B., 191
Annie E. Casey Foundation, 24, 28, 103
Archbald, D., 109
Association for Individually Guided Education, 52, 68
Atkinson, R., 121
Averhart, C., 133
Ayer, J., 108

Back-to-the-basics movement, 36-37, 58, 68, 223
Baker, F., 4, 31, 84, 117
Baldwin, H. J., 194
Barnes, D., 69
Barr, A., 85
Bartels, L., 139
Bascia, N., 113
Bavry, J., 133
Bell, A., 157
Bell, T. H., 63
Benbow, C. P., 86, 87
Bereiter, C., 83, 225
Berlak, H., 109
Bertocci, T. A., 109, 111
Biaggio, A. M. B., 146-148
Bohr, N., 89
Bowles, B. D., 112, 136, 139, 140
Bracken, B. A., 163
Bradley, W., 117
Braverman, M., 99
Bredeson, P. V., 140
Brodinsky, B., 36, 73
Brophy, J., 188
Broudy, H. S., 214
Brownell, S., 204
Bruner, J., 217
Buchanan, A., 55, 75, 128, 194
Bucklin, D., 118
Burk, J. B., 95
Burke, P., 66, 73
Burkhart, H., 157
Bush, W., 9
Business and Operations Section, 11

Calculator, S., 105, 106
Calfee, R., 121, 124, 125
Campbell, D., 85, 87
Carey, D., 142
Carey, R. L., 150-151
Carpenter, T. P., 98, 99, 128, 129, 130, 131, **140-143**, 156, 158, 217, 218, 221
Cassidy, F., 121
Center for Advanced Study in the Behavioral Sciences, 84

Centers of the Wisconsin Center for Education Research
Center for Policy Research in Education, 24, 25, 27, 111, 112
Center for Research on Teacher Education, 24, 25
Effective Schools Center, 25, 29, 187, 225
National Center for Research in Mathematical Sciences Education, 24, 25, 29, 129, 224
National Center for Research on Postsecondary Finance and Governance, 24, 25
National Center on Effective Secondary Schools, 21, 22, 24, 25, 26, 100, 102, 107, 108, 109, 160, 177, 186, 219, 224
Upper Great Lakes Multifunctional Resource Center, 24, 25
Chapman, R., 121, 122, 123, 124, 125
Chase, F. S., 39, 195, 196
Chiang, C., 99
Chiang, P. L., 143
Ciliberti, B., 125
Clodius, R., 117
Clune, W. H., 27, 102, 111-113, 179, 220
Cobb, P., 150
Cohen, A., 153-154
Collis, K. F., 131
Conaway, L., 56, 57, 58, 73, 223
Cook, D. M., 133, 194
Cooney, T. J., 131, 188
Coons, J. E., 113
Cooper, B. S., 180
Cooperative Research Act, 3, 4, 201, 202, 205, 226
Cooperative Research Program, 2, 206
Corporation for Public Broadcasting, 120, 226
Council for Educational Development and Research (CEDaR), 174, 194
Council of Chief State School Officers, 179
Crews, G., 191
Cronbach, L. J., 215, 228
Culberston, J. A., 180
Cunningham, L. L., 180

Damon-Moore, H., 183
Daresh, J. C., 58, 59, 74
Davidson, J. E., 87
Davidson, R., 90
Davis, G. A., 217, 228
Delta Publications, 44
Dershimer, R. A., 227, 228
Derthick, L., 205, 206
Design for improving secondary education, 221
components of, 59-62
comprehensive and enabling objectives of, 61-62
dissemination and implementation of, 65-66
educational improvement strategy, 62, 64
goal-based improvement strategy, 62-64
initial validation of, 62-64
instructional improvement strategy, 62, 64
refinement and institutionalization of, 64-65
Dick, E., 189, 190, 191
Dissemination and Implementation Section, 11
Divine, A., 22
Dix, L., 107
Donnellan, A. M., 217, 228
Donnelly, K., 22
Dorsey, M. F., 207
Doyle, D. P., 180
Dreyfus, L. S., 5, 116-120, 226

Ebel, R. L., 207
Educational product
kinds of, 115
paradigm for developing, 115
Educational research
development-related, defined, 77
improvement-oriented, defined, 78
knowledge-generating, defined, 78
methods of, listed, 77
Educational research facility funding, 30, 31
Educational researcher as university teacher, 209
Educational Sciences Building, 210
Educational television, 117
Effective schools, 66, 68

Eisenhower, President Dwight D., 205, 206
Elementary and Secondary Education Act, 8, 30, 35, 206, 207, 226
Elmore, R. F., 113
Elsdon, M., 133
Elvehjem, C., 3, 204
Encyclopaedia Britannica Educational Corporation, 45, 124
Excellence in Education Award
  Conrad Elvehjem Elementary School, 69
  Webster Transitional School, 63

Farley, F., 87-89, 154, 180, 217
Feldhusen, J., 83, 225
Fennema, E., 98, 99, 106, 108, 129, 141, 142, 143
Fernandez, R., 102, 103, 161
Fischback, T. J., 195
Fischbein, E., 156
Fleming, R., 6, 164, 168, 210
Fletcher, H., 126
Floden, R., 188
Fagarty, J., 204
Forest-Pressley, D., 229
Fowell, N., 95
Fowlkes, J. G., 3, 5, 32, 117
Frayer, D. A., 48, 73, 79, 80, 82, **131-135**, 152, 153, 195, 218
Fred, E. B., 204
Frederick, E., 22
Freeman, D., 188
Frohreich, L. E., 177
Fruth, M., J., 136-140, 191, 196
Frye, C. M., 16, 32
Fuhrman, S., 113
Funding sources (major) of WCER, 1964-1989
  Casey Foundation, 24
  Bureau for Education of the Handicapped (U.S.) 10, 17, 174
  Bureau for Education Professions Development (U.S.), 10, 51
  Chancellor of UW-Madison, Office of, 28
  Ford Foundation, 3, 24, 28
  National Institute of Education, 10, 16, 17, 18, 21, 22, 29, 33, 51, 57, 106, 129, 173, 174, 175, 176, 189, 207, 227, 228
  National Center for Educational Communications, 10, 51
  National Science Foundation (NSF), 4, 9, 24, 25, 28, 126, 129, 173, 174, 180, 186
  Office of Bilingual Education and Minority Language Affairs (U.S.), 24, 25
  Office of Educational Research and Improvement, (U.S.), 20, 22, 24, 25, 29, 33, 180, 186, 226
  Office of Special Education and Rehabilitative Services (U.S.), 17
  Office of Postsecondary Education (U.S.), 25, 28
  Olin Foundation, 29, 187
  Pew Charitable Trusts, 24, 28
  Spencer Foundation, 24, 28, 181
  U.S. Department of Health and Human Services, Public Health Service, 24, 28, 186
  U.S. Office of Education, 1, 3, 4, 6, 7, 8, 9, 10, 15, 18, 24, 25, 126, 129, 166, 167, 168, 170, 174, 175, 191, 205, 206, 227
  UW Graduate School Research Committee, 3, 4, 167
  Wisconsin, State of, through School of Education, 6, 9, 17, 24

Gaa, J., 133
Gage, N., 85, 97
Gale, A., 89
Gardner, B., 166, **197-198**
Gates, H., 108
Genishi, C., 106
Geske, T., 177
Ghatala, E. S., 79, 80, 82, 91, 133, 135, **152-153**
Gillespie, J., 111
Ginsburg, A. L., 180
Gissal, T. J., 163
Glass, E., 83, 86
Goldberg, S. S., 196
Gomoll, R., 66, 73
Goodson, M., 6, 8, 11, 14, 29, 32, 164, 170, 189
Goodwin, W., 14, 32, 146
Goplin, G., 191
Gordon, N. J., 89
Graduate education and Center researchers, 2, 209
Graham, P., 18, 176

Graper, N., 40
Griffiths, D. E., 211
Grinder, R., 147
Grossman, J. J., 23, 189, 191
Grouws, D. A., 131, 188

Haberman, F., 117
Haertel, E., 193
Hale, J. A., 177
Hall, R., 206
Hallinan, M., 99, 106
Hansen, P. J., 194
Hargrave, S., 53
Harrington, F. H., 1, 117, 168
Harris, C. W., 4, 31, 79, 80, 82, 117, 207
Harris, M. (Peg), 193
Harvard Social Studies Project, 110
Harvey, J., 126, 131
Healey, A. D., 125
Heater, D., 111
Hickman, J. C., 210
Hirsch, M., 122, 124
Hjelm, H. F., 1, 168
Hodgkinson, H. (Bud), 174, 175, 176
Hoerr, W. A., 216, 229
Holland, K., 134
Holmes Group, 196
Home-school-community relations program
  interaction patterns in, 138-139
  model of, 139
  principles underlying, 137-138
  processes in implementing, 138-139
Hooper, F., 94, 95
Horowitz, R., 229
Hubbard, W. D., 195
Hull, C., 180
Hunt, J. M., 147

/I/D/E/A/, 51, 52, 68
Idol, L., 82
Implementation of Center educational products
  overview of, 29-30
  IGE, 49-57
  WRISE, 65-66
IGE state networks, 52, 56, 58, 220, 222
IGE Teacher Education Project, 16, 51, 52, 53, 56, 58, 68, 79, 222
Individually Prescribed Instruction, 44
Ingison, L. J., 57, 73
Ingram, J., 139
Instructional programming for the individual student, 41-44, 138
Instructional programs for IGE, overview of, 44-48
Ironside, R. A., 54, 56, 57, 58, 73

Janicki, T., 99
Jencks, C. S., 180
Jenkins, J. W., 178, 197, 180
Jenkins, W. O., 85, 87
Jeter, J., 48, 73, 135
Jipson, J., 157
Johnson, D., 176
Johnson, President L. B., 8, 120
Johnson, T. J., 4, 32, 117
Jones, B. F., 82
Jones, D., 131

Kaestle, C., 20, 125, 176, 197, 180, **181-183**, 212, 220
Kahl, W., 50
Kaiser, H., 88
Karges, M. H., 54, 74, 139
Kasten, K. L., 140
Katzenmeyer, C. G., 57, 58, 73, 228
Kaufman, J. W., 211
Kavanaugh, J., 124
Kennedy, B., 133
Kim, J. E., 139
Klausmeier, H. J., 1, 2, 4, 5, 6, 7, 8, 9, 11, 14, 15, 16, 29, 30, 31, 32, 33, 38, 39, 41, 48, 49, 50, 51, 52, 54, 58, 59, 62, 66, 67, 73, 74, 75, **78-83**, 88, 94, 146, 147, 151, 152, 164, **166-171**, 172, 173, 177, 194, 196, 197, 205, 210, 211, 216, 217, 218, 221, 222
Klenke, W., 139
Klopp, P. M., 55, 75, 128
Knowledge-utilization model of planned change, 65
Koester, L. S., 89
Kratochwill, T., 225

Kreitlow, B., 5, 31, 117
Krupa, W. E., 54, 74, 139

Laboratory of Experimental Design, 83, 84
LaFollette Institute of Public Affairs, 111, 112
Laird, M., 119, 120, 205
Lake, R., 139
Lamal, P., 133
Lambert, P., 88
Landsness, R. M., 109, 110
Lawton, J. I., 93-96, 217
Leadership Series in Individually Guided Education, 53
Learning Multi-Systems, 44
Learning Research and Development Center, 44, 121
Lesgold, A., 91
Lesko, N., 102, 103, **160-162**
Leslie, R., 122, 124
Levin, J. R., 82, **90-93**, 152, 153, 216, 217, 218
Liba, M., 32
Liechty, T., 139
Lindberg, D., 157
Lindeman, R., 83
Lindow, J., 99, 106
Lins, L. J., 52, 74
Lipham, J. M., 49, 58, 59, 74, 75, 140, 196, 219, 228
Little, K., 205
Local school self-improvement
  capability, 59
  districtwide, 66-68
  guidelines, 65
  secondary, 64, 65
Loef, M., 99, 142, 143
Loose, C., 194
Lorenz, R., 32
Lovell, K., 148

Macdermot, H. G., 196
Marinelli, J., 177
Marliave, R., 133
Marrett, C. B., 106-108, 220
Martin, C., 156
Mason, W., 168, 228
Mathews, W., 108
McCarty, D., 170, 173, 176, 202, **208-211**
McCluhan, M., 118
McLaughlin, M. W., 113
McClean, L., 93
Meierhenry, W. C., 52
Metaplan for school self-improvement, 66-68, 220
Metcalf, L., 100
Metz, M., 102, 160
Miles, W., 139
Mitzel, H. E., 180, 196
Monk, D. H., 113
Montgomery, M., 131
Morrow, R. G., 50, 74
Moser, J. M., 126, 128, 130, 131, 141, 143, 156
Moser, R. H., 139, 140
Multiunit organizational-administrative arrangements
  Instructional and Research Unit, 39
  instructional unit, 39-40
  Instructional Improvement Committee, 40
  Systemwide Program Committee, 40

National Academy of Education, 83, 178, 181
National Center for Educational Research and Development, 4, 10, 16, 33, 129, 216, 228
National Commission on Excellence in Education, 37, 74
National Council of Teachers of Mathematics, 130
National Defense Education Act, 83
National Research Council, 107
National Review, 37
National School Public Relations Association, 35, 36, 44, 51, 74, 223
Nelson, G., 164
Nelson, N., 48, 73
Neperud, R. W., 89
Network of innovative secondary schools, 59
Newmann, F., 21, 22, 26, 33, 59, 102, **108-111**, 219
Nielsen, T., 118

O'Hearn, G., 94, 151, 171

Oinonen, C., 139
Oliver, D., 110, 111
Olneck, M., 178
Olsen, L. F., 154-156
Opalewski, L., 22, 166, 178, **199-200**
Ormson, M., 23, 191
Osin, L., 125
Otto, W., 15, 16, 17, 18, 33, 44, 74, 174, 175, 176, 212

Page, R., 161
Palmer, J. R., 100, 176, 179, 181, 182, 202, **211-214**
Patterson, J. H., 113, 178, 179, 180
Pautsch, T., 63
Pearson, P. D., 125
Pella, M. O., 85, 151
Perkins, D., 111
Perry, P., 146
Peterson, E., 32
Peterson, L. J., 177
Peterson, P. L., 96-99, 105, 106, 141, 142, 143, 162, 163, 218
Petzold, R., 191
Piaget, J., 79, 95, 148, 169, 217
Piele, P., 113
Pimm, D., 156-158
Pirrozolo, F. J., 93
Pittelman, S. D., 45, 75, 123, 124, 129
Pizzillo, C. M., 195
Polya, G., 126
Popkewitz, T., 56, 74, 100, 103, 128, 129
Porter, A., 20, 22, 29, 84, 112, 176, 180, 182, 183, **184-188**, 212, 225
Prasch, J., 14, 32
Pressley, M., 91, 93, 153
Price, G., 128, 157
Product development
1964-1966, 7, 8
1966-1972, 11-14
1972-1976, 15, 16
Product development/research projects of the Center
Cognitively Guided Instruction, 24, 25, 141-142, 221
Developing Mathematical Processes, 11, 15, 44-45, 47-48, 55, 58, 126-128, 173, 174, 220, 221, 222, 226
Individually Guided Education, 7, 9, 10, 14, 15, 16, 18, 29, 37-39, 49-58, 68-73, 79, 100, 101, 130, 136, 169, 170, 172, 173, 174, 193, 194, 195, 197, 218, 219, 220, 221, 223, 224, 227
Individually Guided Motivation, 15, 44, 47, 48, 54, 55, 132-135, 152, 193, 220, 222
Patterns in Arithmetic, 5, 7, 10, 11, 14, 29, 120, 148, 193, 220, 222
Pre-Reading Skills Program, 11, 15, 44, 45, 47, 121-124, 128, 153, 174, 220, 221, 222
Wisconsin Design for Reading Skill Development, 11, 15, 44-45, 47, 54, 55, 57, 58, 128, 173, 174, 193, 220, 222
Wisconsin Program for the Renewal and Improvement of Secondary Education, 30, 65, 66, 220, 222, 224
Professors in-group and out-group, 170, 210, 212
Programs of individualization, 35
Purkey, S. C., 178, 180

Quie, A., 120
Quilling, M., 41, 48, 50, 73, 74, 133, 135, **192-195**

R&D Centers Program, 227
Ragsdale, R., 93
Ramsey, C. E., 211
Ranking of schools of education, 202
Raskas, H., 139
Read, C., 159
Reddy, P., 95
Regional Educational Laboratories Program, 227
Rendfrey, K., 134
Research programs of the Center, overview of
1964-1966, 7-9
1966-1972, 11-14
1972-1976, 15-16
1976-1985, 18-19
1985-1989, 25-29
Research programs of the Center
Children's Learning and Development, 15
Concept Learning in Subject Fields, 7
Concept Learning Basic Research, 7

Computer Applications for IGE, 7
Conditions of School Learning and Instructional Strategies, 15
Dissemination and Implementation, 11
Evaluation of Practices in Individualized Schooling, 18
Learning and Child Development, 18
Organization for Instruction and Administrative Arrangements, 15
Product Implementation, 15
Reading, Language, and Communication, 18
Studies in Mathematics, 18
Studies of Administration and Organization, 18
Studies of the Implementation of Individualized Schooling, 18
Student Diversity and Classroom Processes, 19
Student Diversity and School Processes, 19
Student Diversity and Social Policy, 19
Student Diversity in Learning and Development, 19
Research projects of the Center
Adult Re-education, 7
Autistic Children, 17
Computer Simulation of Concept Attainment, 11
Creative Problem Solving, 11
Culturally Disadvantaged, 7
Educational Effectiveness of Reorganized School Districts, 11
Effecting Planned Educational Change, 11
English Language and Composition, 11
IGE in the Multiunit School Secondary, 15
Increasing School Achievement of Low-Income Minority Children, 24
Instructional TV, 7
Language Concepts and Cognitive Skills, 11
Master's Degrees in the United States, 24, 28
National Study of Young Children's Lives, 24, 28
New Futures Initiative, 24, 28
Partners in Improving Children's Achievement, 24, 28
Peer Group Pressures on Learning, 11
Project MODELS, 11, 14, 15, 194
Reform Up Close, 24, 28
Research on Science Learning and Teaching, 24, 28
Rule learning, 11
Social History of the American Reading Public, 24, 28
Social Variables in Learning, 7
Specialized Office 3, 17
Upward Bound, 25, 27, 28
Urban Mathematics Collaborative Documentation, 24, 28, 129
Verbal Concepts in Speech, 11
Research Triangle Institute, 55
Restructuring the Wisconsin Center, 212-213
Reynolds, M., 211
Richards, J., 150
Ripple, R., 83
Rodrigues, A., 148
Romaniuk, J., 57, 73
Romberg, T. A., 45, 55, 56, 58, 74, 94, 100, **125-131**, 141, 143, 156, 158, 174, 194, 218, 223, 224
Rosskopf, M., 148
Rossmiller, R. A., 9, 14, 15, 16, 17, 18, 32, 33, 39, 45, 48, 49, 51, 52, 54, 73, 74, 75, 94, 139, 140, 154, **172-177**, 196, 211, 212
Roth, P. A., 95
Royalty income
federal policy regarding, 44
use made of by Center, 44
royalty trust fund, 44
Rutter, R., 102, 103, 110, 161

Saily, M., 14, 32, 39, 73, 74, 75, 139, 140, 174, 196
Samelian, J. K., 146
Samuels, S. J., 229
Sarason, S., 162
Saturday Subway Ride, 14
Saunders, R. A., 95
Schaffarzick, J., 18, 33
Schmidt, W., 188
Schreiber, P., 159, 217, 229
Schutz, R. E., 194
Schwille, J., 188
Sears-Roebuck Foundation, The, 16, 30, 51, 53, 79, 171, 174, 222
Sears-Roebuck Foundation–Bascom Professorship in Education, 79
Secada, W., 143
Segal, J., 111
Selden, R., 176
Serlin, R. C., 62, 74

Servais, W., 156
Shalala, D., 20
Shulman, L. S., 113
Silliman, E., 106
Simpson, S., 148
Sipple, T. S., 81, 82, 83
Skemp, R., 157
Skinner, B. F., 217
Smith, B. O., 54, 100
Smith, G., 102, 161
Smith, K. B., 134
Smith, M. S., 17, 18, 19, 20, 33, 102, 112, 176, **178-180**, 181, 183, 212, 216, 220, 229
Snow, R., 97
Soft-money faculty support, 213
Sorenson, J., 41, 50, 74, 133, 193, 194
Southwest Regional Educational Laboratory, 121
Spada, M., 148
Spinelli, R., 105, 106
Staats, A., 146, 147
Stafford, J. C., 211
Stanford Center for Research on Teaching, 97
Stanley, J. C., Jr., 5, 31, **83-87**, 117, 147
Stanley, W. O., 100
State education agency
  list of 23 participating in IGE implementation, 51
  participation in nationwide IGE practices survey, 68
  role in nationwide IGE implementation, 50
  state IGE coordinators, 55
Stedman, L. C., 178, 179, 183
Steffe, L. P., 148-150
Sternberg, R. J., 87
Stewart, D., 22, 55, 74, 75, 128, 178, 195
Stiles, L. J., 2, 4, 5, 6, 7, 33, 84, 117, 166, 170, **203-207**, 212
Stoiber, K. C., 99, **162-163**
Stone, C., 160
Strelau, J., 89
Sugarman, S. D., 113
Sum, A. M., 125, 183
Suppes, P., 228
Survey of elementary school educational practices, 68-72
Swadener, E., 96
Swing, S. R., 99, 105, 106, 163
Sykes, G., 18, 33, 113

Tabachnick, R., 56, 74, 100, 103, 128, 176
Talbert, J. E., 113
Tax revolt, 36, 68, 70
Teasdale, C., 189, 191
Technical Section, 11, 44
Thorndike, R., 86
Tinsley, K., 183
Treptow, S., 191
Trollinger, W. V., 183
Turnbull, B. J., 180
Tyler, R. W., 215, 229

Undergraduate teacher training and Center researchers, 8, 209
Underwood, B. J., 91, 152, 169
Underwood, J., 113
U.S. Bureau of Research, 4, 129
U.S. Department of Education, 25, 28, 66, 224
U.S. General Accounting Office, 66, 75

Valli, L., 161
Van Engen, H., 5, 117, 118, 120, 148
Van Pelt, M., 113, 178
Venezky, R., 45, 75, **120-125**, 153, 174, 217, 218
Vief, G., 90
Vinovskis, M. A., 183
Volunteers for Educational Research, 206, 207
Volz, M. L., 177
von Glasersfeld, E., 150
Voss, J., 111

Wagner, D., 125
Waller, G., 229
Walter, J. E., 49, 50, 52, 74, 75, **195-197**
Wanska, S., 95
Wardrop, J. H., 133, 194
Webb, N., 128, 129
Wedemeyer, C., 85, 119
Wegner, G., 148

Wehlage, G. G., 22, 26, 56, 59, 74, **100-103**, 128, 160, 161, 219
Wende, J., 190
West, C. K., 202, 216, 229
Westley, B., 118, 119
White, P. A., 113
Whitsitt, W., 53
Wiersma, W., 48, 75
Wiley, D., 83
Wilkinson, A. C., 218, 229
Wilkinson, L. C., 99, **103-106**, 176, 218
Wisconsin Center for Education Research, 1982-1989
  1982-85 directors and funding, 17
  1982-85 programs, 18-19
  1985-89 directors and funding, 20, 24-25
  1985-89 programs, 20-29
Wisconsin Center for Educational Policy, 111, 113
Wisconsin Department of Public Instruction, 2, 29, 50, 66, 75, 194, 206
Wisconsin High School, 201, 206
Wisconsin Idea, 118, 119, 208
Wisconsin R & D Center for Cognitive Learning, 1966-1976
  directors and funding, 9-10
  programs, 10-16
Wisconsin R & D Center for Individualized Schooling, 1977-1982
  directors and funding, 17
  programs, 18-19
Wisconsin R & D Center for Learning and Re-education, 1964-1966
  directors and funding, 6
  programs, 6-9
Wisconsin Week, 202
Witte, J., 112, 113
Wittick, W., 85
Wittrock, M. C., 93, 131, 143
Wolff, P., 90
Wood, T., 150
Woolpert, D. G., 170, 188-192
Wyner, N., 162

Young, E., 117, 118, 210
Yussen, S., 90, 217, 229

Zajano, N. C., 55, 57, 73, 75
Zindler, M. C., 62, 74

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